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SMALL-CALIBER AMMUNITION IDENTIFICATION GUIDE

VOLUME 2

20-mm TO 40-mm CARTRIDGES

30 AUGUST 1985

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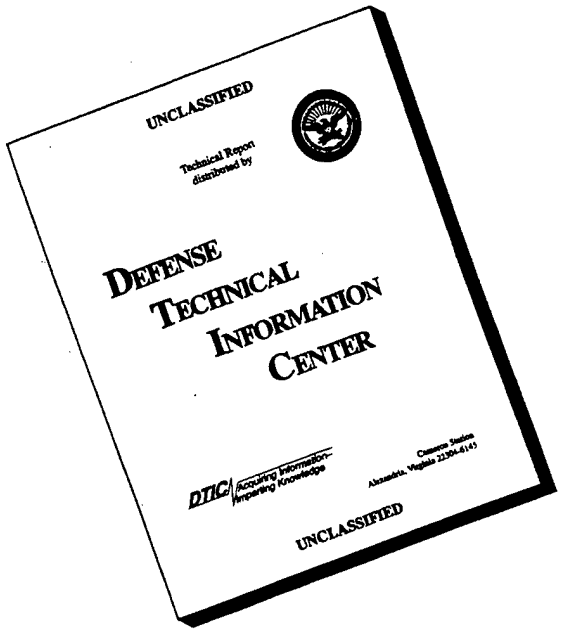

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Small-Caliber Ammunition Identification Guide

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Volume 2

20-mm to 40-mm Cartridges

AUTHOR
Albert Watson, III

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PREFACE

This guide, Volume 2 of a two-volume series, supplements Volume 1, which provides identification procedures for small-arms cartridges of 15-mm caliber and below. Volume 2 is designed to assist the reader in identifying military cartridges in calibers from 20 mm to 40 mm as to cartridge designation, country, and weapon(s) for which the cartridges are intended. Like Volume 1, it provides persons without a technical background in ammunition basic information on cartridge types, construction, and terminology, as well as more detailed identification data on each cartridge. Additional information on these cartridges can be found in various exploitation reports on individual rounds. A consolidated listing of these exploitation reports is provided in the appendix; future editions of this volume will include pertinent data from exploitation reports of 20- to 40-mm cartridges.

Coverage of this volume is limited to cartridges in the 20- to 40-mm caliber range made since 1930 and designed for military use; this excludes shotgun cartridges, riot-control cartridges, and signal cartridges, and, with few exceptions, subcaliber cartridges. Also excluded, because of their age and limited use, are several types of 26-mm cartridges developed during World War II by Germany for use in the 26-mm Kampfpistole, a rifled weapon that was developed from the signal pistol.

The information contained in this guide has been derived from a variety of sources: Examination of cartridges, intelligence and explosive ordnance disposal reports, US and foreign technical publications, and contributions by knowledgeable individuals.

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SECTION I

INTRODUCTION

1. General

a. This guide provides reference data on (and outlines procedures that will aid in the identification of) cartridges in the 20- to 40-mm range. It thus supplements Volume 1, which deals with the identification of small-arms cartridges up to 15 mm; no cartridges between 15 mm and 20 mm are currently in military use. Much of the information that appears in Volume 1 is applicable in some degree to the larger-caliber cartridges described in this volume, so the reader is advised to use these publications as a two-volume set.

b. During the past 40 years, numerous functional types, models, and color codes in many calibers of ammunition have been introduced worldwide, so the information in this guide is limited to cartridge designation and country and year of manufacture. Some guidance is provided as to the design and visual identification of functional types, but the determination of specific model designations or identification of color codes used by each country is outside the scope of this volume.

c. The term "cartridge identification" can encompass a wide span of activities, ranging from the simple determination of cartridge's caliber and case length to a detailed examination that can include its country of origin, functional type, model or type designation, and even lot number, year, and place of manufacture. The problems involved in the identification of cartridges may be summarized in three questions, which this guide will help to answer.

(1) What is the cartridge designation? This is expressed by a brief descriptive designation that includes the projectile caliber and case length. This designation is applicable to all cartridges that can be fired in guns chambered for this specific cartridge.

(2) Who made the cartridge, and when? Normally, this information can be derived from the markings that appear on the projectile, on the case wall, or on the cartridge base. If the cartridge is unmarked, or if the markings are for any reason inadequate, a detailed examination and comparison with similar cartridges of known origin may be necessary. Because of its technical complexity, such a comparison falls outside the scope of this guide.

(3) What is its functional type? More specifically, does the projectile contain an explosive charge that demands added caution in handling and storage? Frequently, this can be determined beyond doubt from markings data, but if any question exists, an examination by technically qualified ammunition specialists will be necessary.

d. Ammunition in the 20- to 40-mm category is frequently termed automatic gun ammunition, since with, very few exceptions, all of the cartridges produced today in these calibers are designed to be fired in fully automatic weapons similar in operation to, but larger than, heavy machineguns. Cartridges in these calibers vary widely in design and performance, ranging from low-power cartridges that differ little from small-arms cartridges except in caliber and projectile construction to high-performance antitank (AT) and antiaircraft (AA) cartridges. Cartridges in the 20- to 40-mm range differ from small-arms cartridges principally in their use of artillery-type projectiles, frequently

with an explosive charge, instead of the jacketed bullet construction typical of small-arms ammunition. In common with smaller-caliber cartridges, they almost invariably have a one-piece, drawn-metal cartridge case; the primer may be either a percussion primer of the type used in small-caliber cartridges or an artillery type electric or percussion primer with a black-powder igniter charge.

e. Cartridges in this range originated with the 1-inch Gatling machinegun, introduced as early as 1866, which was followed by 1-pounder (approximately 37-mm) cartridges of several types, fired either from handpower-operated guns such as the Gardner, Nordenfeldt, and Hotchkiss systems or from single-shot, quick-firing guns. A self-powered automatic gun, the 37-mm Maxim, appeared as early as 1885. The term "pom-pom" was originally applied to this gun. Development since World War II has been directed primarily toward improved ammunition for automatic or power-operated guns for aircraft and antiaircraft use, with a reduced effort in the area of cartridges for semiautomatic weapons for accurate aimed fire against point targets.

f. Some of the cartridge types that are described in this guide were produced 40 or more years ago. Cartridges made during and even before World War II are not necessarily unserviceable because of their age; if they have been stored under favorable conditions of low humidity and low-to-moderate temperature, and if the brass cartridge case has not become brittle from exposure to the mercuric compounds in the primer or from improper annealing of the metal, they may be safe to fire, although fuzes and tracers may not function reliably. Serviceability must be determined through inspection and testing by qualified ammunition specialists.

2. Organization

This guide comprises four major sections.

a. Section I outlines the scope of this guide and its organization. It also provides general information on construction, characteristics, and terminology of automatic gun ammunition that will aid in the use of this guide.

b. Section II provides instructions for the use of this guide in the identification of cartridges from dimensional and visual data.

c. Section III provides a series of outline drawings of cartridge cases, a tabulation of major cartridge dimensions, and a brief description of each cartridge type in terms of its origin, using weapons, principal countries of manufacture and use, and current status. Cross-reference of information in these three areas is aided by the use of an index number that is assigned to each cartridge designation.

d. Section IV presents representative cartridge identification data for each of the major countries that has produced ammunition in this caliber range.

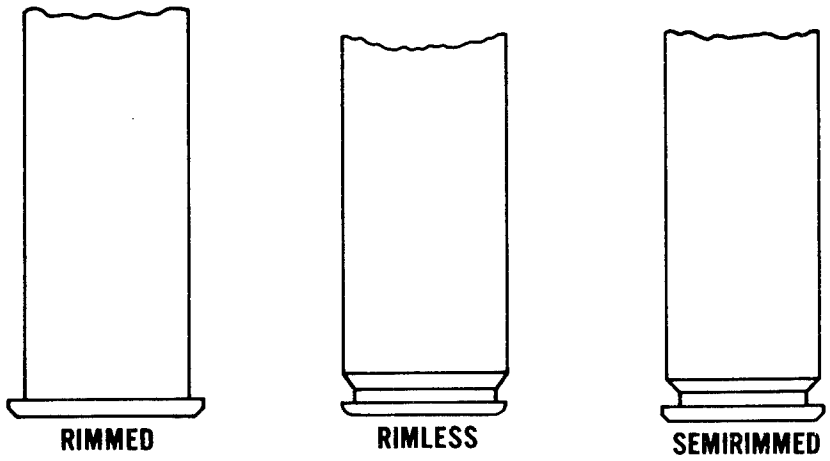
3. Cartridge Cases

The primary feature in cartridge identification is the cartridge case. Its shape and dimensions, which must conform to the chamber size of the gun for which designed, indicate the type and probable military role of the weapon, which in turn may suggest the country of origin or the political affiliation (e.g., Communist, Western, Third World) of the user. Key aspects of cartridge-case design and construction are outlined in the following subparagraphs.

a. The cartridge case (which, incidentally, can account for more than half the weight of the complete cartridge) provides a sturdy, weatherproof container that unites the primer, propellant, and projectile into a unit and protects them from damage in storage, handling, and loading or feeding. During firing, the case provides obturation, sealing the breech end of the barrel to prevent the escape of hot propellant gases into the gun mechanism. When automatic weapons are fired, the cartridge case serves an equally important purpose in acting as a heat sink: It extracts a significant portion of excess heat from the gun chamber after each shot, thus reducing the risk of overheating the gun and the attendant possibility of premature firing (cook-off).

b. To provide desired performance characteristics, military cartridge cases must be robust; all are of centerfire construction, with a reinforced cartridge case head and a centrally located primer that ignites the propellant contained in the cartridge case. Cartridge cases are made principally of brass or mild steel (either plated or lacquered), although in recent years aluminum cases have been used increasingly. Cases are manufactured by punch and die operations, termed "drawing," with heat treatment to provide desired metallurgical characteristics.

c. Cartridge base types, which serve a functional purpose in the feeding, positioning for firing, and extraction of the fired case or the unfired cartridge, are valuable identifying features. For convenience in cartridge identification, the cartridge base description is used as an element in the descriptive designation of the cartridge. The five base types in use, with their abbreviations, are as follows: rimmed (R), rimless (no abbreviation), semirimmed (SR), belted (B), and rebated (RB). These types, which are shown in figure 1, are described in the following subparagraphs.



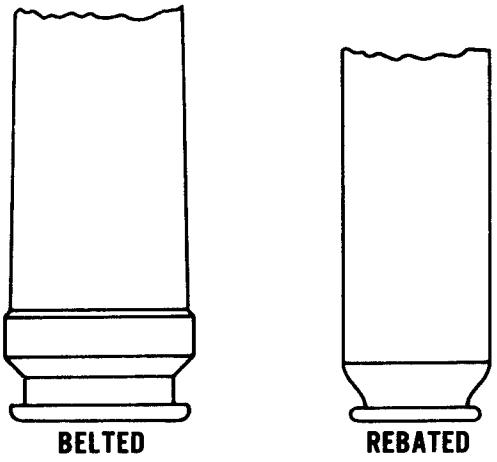


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Figure 1. Cartridge Base Types

(1) Rimmed cartridge cases have a rim, or extractor flange, extending beyond the cartridge body; the rim seats against the breech face and aids in extracting the fired case. There may be a slight undercut or groove in the case body ahead of the rim.

★ (2) Rimless cases have an extraction groove in the case body, leaving a flange at the base of the case. The diameter of this flange is the same as, or very close to, the diameter of the cartridge case body ahead of the groove.

(3) Semirimmed cases have an extraction groove in the case body. The diameter of the flange at the case base is distinctly larger than the diameter of the cartridge case ahead of the groove. A semirimmed case can be identified by laying a straightedge along the cartridge body; a district gap will be noted between the case body and the straightedge, just ahead of the extraction groove.

(4) Belted cartridge cases have a pronounced raised belt around the cartridge case body ahead of the extractor groove. The rim diameter is not significant; it may be greater than, the same as, or less than the belt diameter.

(5) Rebated cartridge cases have a flange at the rear of the extractor groove; the diameter of the flange is distinctly less than the case body diameter.

d. Fired cartridge cases can provide information on caliber designation, country of origin, year of manufacture, and primer type. Cases may also carry markings that indicate the model and functional type of the fired projectile. Finally, examination of a fired case by a weapon expert can, under favorable conditions, provide information as to the type of gun that fired the cartridge.

4. Projectiles

a. Projectiles in the 20- to 40-mm range follow the design of artillery projectiles rather than of small-arms bullets in that they have a well-defined rotating band and a bourrelet on the projectile body instead of a bullet jacket that is engraved by the rifling in the gun barrel. The relatively large mass (weight) of these projectiles permits a more sophisticated design and complex construction, tailored for a specific type of target and frequently involving an armor-piercing penetrator or an explosive filler with some type of fuzing. These projectiles are intended primarily for use against materiel targets such as aircraft, armor, and defended positions; their antipersonnel effect is achieved principally by projectile fragments rather than, as for small arms, by direct impact.

b. In the designation of functional types, projectiles--and thus, cartridges--in this caliber range also follow artillery practice. For example, a cartridge whose projectile contains no explosive payload or penetrator, and which in small-arms ammunition terminology would be designated a ball cartridge, is normally termed a practice cartridge, although the term ball cartridge may occasionally be encountered. If the projectile contains a tracer, the cartridge will usually be designated a practice tracer (PT) cartridge, and only rarely a tracer cartridge.

c. Explosive projectiles include high-explosive (HE) and high-explosive incendiary (HEI) rounds; the latter may carry a tracer and then be termed HEI-T. Explosive projectiles have a fuze of some type to initiate detonation of the explosive charge; this may be a point-detonating (PD) or base-detonating (BD) type, depending on its location in the projectile. If the fuze has a self-destruct

feature, to initiate detonation and thus destruction of the projectile at a predetermined time or distance after firing, the fuze will be designated point detonating self-destruct or base detonating self-destruct (PDSD or BDSD). Such fuzes are frequently used in antiaircraft fire or air-to-air fire to ensure that a projectile that misses its intended target will detonate in the air and not land in a friendly area. Self-destruction can also be initiated upon tracer burnout. The tracer element is a body of pyrotechnic material in a cavity in the base of the projectile; the material is ignited by the burning propellant and emits a visible or smoke trace to enable the projectile flight to be followed and permit adjustment of fire on the target. If a heat-sensitive detonator is placed between the tracer and the explosive filler, it will be initiated as the tracer burns out, perhaps 2 seconds after ignition, and thus detonate the projectile.

d. Kinetic-energy, armor-defeating projectiles include armor-piercing (AP) and armor-piercing-incendiary (API) projectiles, which may have a tracer and thus be termed AP-T and API-T. Solid SP projectiles were at one time termed "shot," and the term "AP shot" may still be encountered. If the projectile has an explosive filler and fuze (normally a base fuze) as well, it may be designated armor-piercing high explosive (APHE), armor-piercing high explosive incendiary (APHEI), or armor-piercing high explosive incendiary-tracer (APHEI-T), depending on its construction. A special type of high-performance AP projectile, with a smaller-diameter core or penetrator of tungsten carbide (abbreviated WC) or tungsten alloy, may be combined with a projectile body that is designed to separate from the core as soon as the projectile has left the gun muzzle. The projectile base that is discarded is termed a "sabot"; the complete projectile is termed "armor-piercing, discarding sabot," or APDS. When a

tracer is present, the projectile becomes APDS-T. If the projectile has a tungsten carbide penetrator, the designation is APDS (WC) or APDS-T (WC). The chief advantage to APDS projectiles is that the heavy, small-diameter penetrator encounters less air resistance during flight and thus does not lose its velocity as rapidly as a larger-diameter projectile; therefore, it has a shorter time of flight and higher impact velocity at longer ranges. Examples of functional types are found in figure 2.

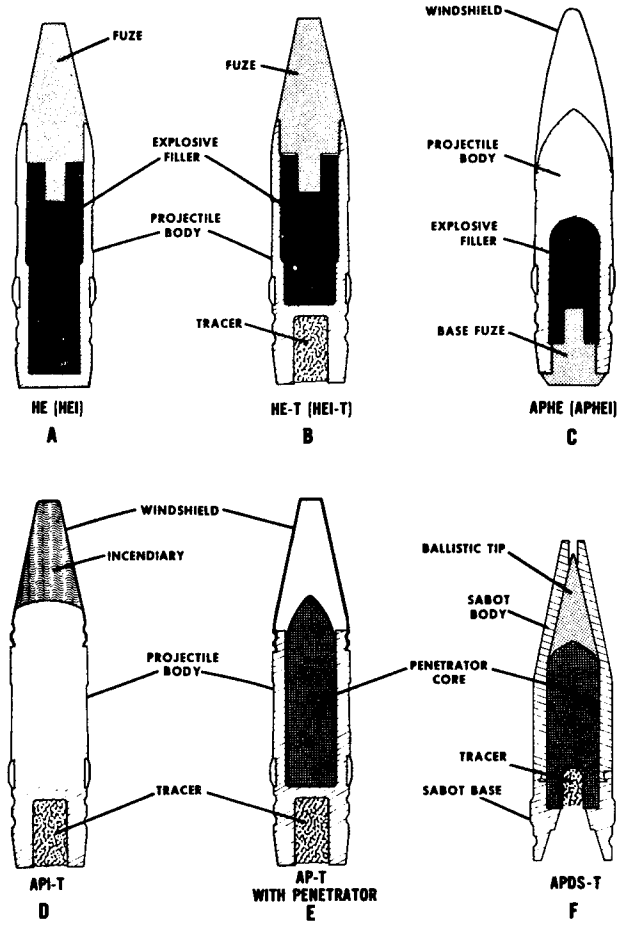

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Figure 2. Functional Projectiles

5. Primers

Cartridges in the 20- to 40-mm range may use a wide variety of primers, from simple small-arms-type primers for low-performance cartridges to complex artillery-type primers. Electric primers are used almost exclusively for aircraft gun ammunition. These types are described in the following subparagraphs.

a. Small-arms primers may be of either the Boxer or the Berdan type. Boxer-type primers consist of a thin metal primer cup and an "anvil" of stamped metal. Between the primer cup and anvil is a pellet of primer mixture that is initiated when the primer is struck by a firing pin. The primer is inserted into a seat in the base of the cartridge. One axial flash hole normally conducts the flash to the propellant in the cartridge case. Berdan primers differ only in having the anvil made as a permanent feature of the primer pocket; the primer cup contains only the primer mixture. Berdan-primed cartridge cases normally have two flash holes, but cases with a single flash hole to increase the intensity of the primer flash have been found in small-arms cartridges. Boxer- and Berdan-type primers are shown in figure 3.

b. Artillery-type percussion primers are separate assemblies that are either threaded or pressed into the base of the cartridge case. The primer body may contain merely a Boxer-type or Berdan-type primer and a black-powder primer charge, or it may be more complex, involving a firing plug that initiates the percussion element and also keeps gas from escaping if the primer cup should perforate on firing. A primer of this type is shown in figure 4, view A.

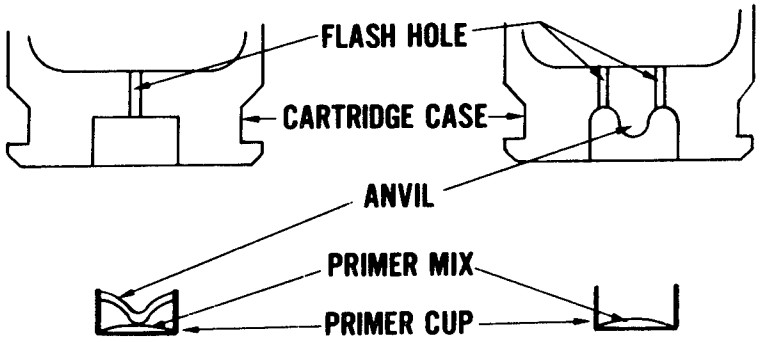

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Figure 3. Small-Arms Primers

c. Instead of a percussion element, electric primers contain either a conductive primer mixture or a bridge wire embedded in the ignition mixture. A firing current (normally 24 to 28 V DC) is conducted through a contact on the cartridge base to the conductive ignition mixture or bridge wire and returns through the cartridge case and chamber wall. This current ignites the primer mixture and initiates the propelling charge. Electric primers may be designed to be pressed or threaded into cartridge cases; they may be dimensionally interchangeable with percussion primers, but they can be recognized by a ring of insulating material that surrounds the contact. A simple type of electric primer is shown in figure 4, view B.

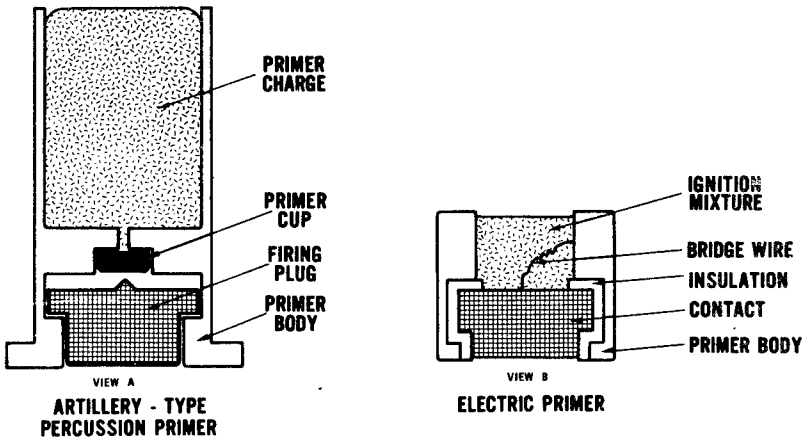

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Figure 4. Artillery-Type and Electric Primers

6. Propellant

Depending on the performance that is expected, propellants may vary from small-arms-type ball powder to multiperforate cylindrical grains. Single-base nitrocellulose propellant predominates. Closely related to propellants is the high-low pressure system, designed to provide a low-pressure force of relatively long duration that will impart a low to moderate velocity to heavy projectiles. This is achieved by confining a small quantity of propellant in a strong chamber within the cartridge case adjacent to the primer and providing this chamber with only small openings into the case. Upon firing, the propellant creates high pressure within the interior chamber; the pressure escapes at a predetermined rate into the cartridge case to provide a low but continuing pressure against the projectile. The advantages of this procedure is that the effective pressure against the projectile rises slowly and never exceeds a moderate limit, allowing the gun chamber to be designed for a much lower maximum pressure than would otherwise be the case. Figure 5 shows a section of a high-low pressure cartridge.

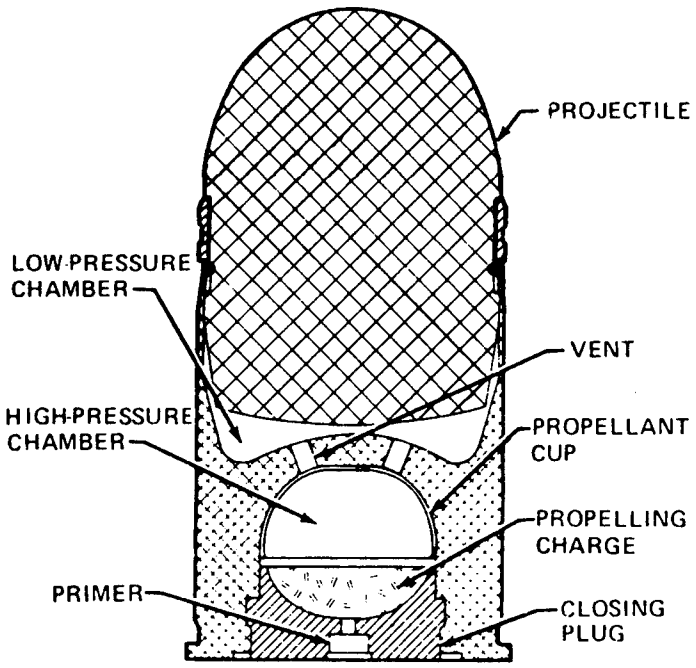

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Figure 5. Typical High-Low Pressure Cartridge

7. Cartridge Designation

a. "Cartridge designation" denotes an identifying terminology, unique to a specific cartridge, that includes the approximate caliber of the projectile as well as further identifying data. For convenience, and because many cartridges already have a metric designation, the metric system of cartridge designation used in Volume 1 will also be followed in Volume 2.

b. The metric designation consists basically of two numerical elements--the projectile diameter and the case length--which are expressed in millimeters. The first element is the actual or nominal caliber of the projectile, expressed for automatic

gun cartridges to the nearest millimeter. The second element is the case length, also expressed in millimeters. Since case lengths may vary by several millimeters wihout impairing proper gun operation, this case-length figure is frequently a nominal or approximate length. The first and second elements are separated by the letter x, which is read as "by." Thus, the designation "20x110" indicates a cartridge with a projectile diameter of 20 mm and a nominal case length of 110 mm. To further distinguish between otherwise similar cartridges, a suffix letter is added to indicate the cartridge base shape for other than rimless cartridges. The suffix letters used are as follows: R for a rimmed case, SR for a semirimmed case, B for a belted case, and RB for a rebated case. The absence of a suffix letter indicates a rimless case. Thus, the preceding example, 20x110, indicates that the case is rimless. A 20x110 case with a rebated case head is designated as 20x110RB. In this one instance, two rimless cartridges have the same caliber and case length but differ in the case diameter and contour. In this guide, one of these cartridges has been given the arbitrary suffix USN to distinguish it from the more common Hispano-Suiza cartridge; thus, the designation 20x110 USN is used.

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SECTION II

CARTRIDGE IDENTIFICATION PROCEDURES

1. General

To identify an unknown cartridge or a fired cartridge case with the aid of this guide, all that is needed is an accurate measuring device. Since all measurements are given in metric units, a vernier caliper that reads to 0.1 mm is adequate; in an emergency, a metric scale that reads to 0.5 mm may be used. Calipers or micrometers graduated in inches will also serve, provided that the measurements are converted to metric units. Since 1 inch is equal to 25.4 mm, the inch measurement (in decimals, not in fractions of an inch) is multiplied by 25.4 to arrive at the metric measurement.

2. Caliber and Cartridge Designation

a. It has been noted that cartridge designation is expressed by a nominal caliber and case length. Dimensional data in section III of this guide are presented in order of caliber as the principal identifying factor and thereafter in order of increasing case length. Once the projectile diameter and case length (or, for a fired case, the case-mouth diameter) of the unknown cartridge have been measured and the type of cartridge base noted, either of two methods can be followed to establish the cartridge designation.

b. For a "rough-and-ready" identification, refer to the cartridge case outline drawings in section III. Look for a cartridge case drawing with a caliber and case length designation that matches the unknown cartridge and which has the same type of cartridge head. The case lengths may

not be identical, but a case outline can usually be found that is a close match to the unknown cartridge or case. Having found a good "fit," note the applicable cartridge designation and the corresponding index number. For further information, refer to section III, part B, of this guide, where data on the origin, characteristics, and use of this cartridge will be found by reference to its index number.

c. For further identification, or in case of doubt, measure the cartridge case length as before; in addition, measure the projectile diameter, if one is present, and the case diameters at the following points: Rim (the rearmost diameter of the cartridge case), case head (or belt, for belted cartridges), and case mouth. Using the caliber and case length as key dimensions, refer to the tabulation of case dimensions in table I, section III, to find the cartridge designation with base type and dimensions that match the unknown cartridge. The dimensions in this table are representative measurements; individual cartridges, and particularly fired cases, may vary from the dimensions shown. Although the projectile diameter should be very close to the indicated value, the case length may vary by several millimeters from the dimensions given, while diameters of the case may be up to 1 millimeter more or less than the figures shown.

3. Country and Year of Manufacture

a. Identification as to country of manufacture must be based on several factors: The caliber designation, the headstamp marking, if present, and any other markings that may appear on the fuze, projectile, or cartridge case.

(1) When the caliber designation has been determined, the information provided for that cartridge in part B, section III, will suggest

countries that could have manufactured the cartridge and eliminate from consideration other countries that for reasons of political allegiance, or because of the year of production, could not have produced it. Cartridges in calibers used by the Soviet Union may be assumed with a very high degree of probability to have been produced within the Eurasian Communist countries (ECC), while cartridges in use in the Western countries can with equal probability be attributed to a non-Communist country. Exceptions to this general rule exist, but such cartridges can be identified from their markings.

(2) The headstamp marking, taken together with other markings that may be present, provides further identification; the type of alphabet and the words and abbreviations used can be compared with the information presented in section IV of this guide on characteristic cartridge-markings practices of the major cartridge-producing countries (and also with the headstamp and markings data in vol I).

b. The year of production is usually (but not always) given in the headstamp marking. It also appears frequently in stamped or stenciled lot number markings that may be found on the cartridge, projectile, or fuze. The year may be indicated by a two-digit or four-digit number, in non-Western numerals (oriental or Arabic*), or in a letter code. Examples of these markings are given in section IV.

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*Except for the numerals 1 and 9, the "Arabic" numerals used by Western countries do not equate to those used by Arabic-speaking, and some other, countries (see sec IV, para 4).

4. Functional Type

Except for the APDS or APDS-T projectile, which has a characteristic design that is usually unmistakable, the determination of a projectile's functional type from its external appearance alone can be risky. A cartridge with a nose fuze that is stamped with a model designation must be presumed to contain HE filler unless its markings indicate beyond question that the projectile is inert-loaded. The converse, unfortunately, is not true; the absence of a nose fuze cannot be taken to mean that the projectile does not contain a hazardous filler of some type. Projectiles of typical AP construction may have an explosive filler and a base fuze, while projectiles without a fuze of any type whatever may contain a sensitive HE or a hazardous filler such as white phosphorus. A definite identification can be made only from the markings and color code (if present) on the projectile or, less often, on the cartridge case. Unfortunately, these markings and color codes have often changed over a period of years; as a result, they exist in such a proliferation that a comprehensive guide, covering all countries and years of manufacture, is not feasible. The marking systems used today by the major countries that produce ammunition in this caliber range are given in section IV. Additional information on cartridges made by the United States and on ammunition used during World War II can be found in the publications cited in the bibliography.

5. Safety in Handling

a. Cartridges in the 20- to 40-mm caliber range, unlike small-arms cartridges, have projectiles that, for the most part, contain HE and a fuze and thus present a safety hazard. It must be emphasized that no cartridge can be considered to have an inert-loaded projectile unless its functional type has been determined beyond question

from markings or color coding that are correct for and applicable to its country of origin and year of manufacture. Even projectiles that follow the US/NATO color marking system and are identified by the blue projectile body as practice types may contain a spotting charge or other functional element that presents some degree of hazard.

b. If any question exists as to the safety of a projectile or cartridge, it must be considered as possible HE-loaded and thus hazardous, and referred to an explosive ordnance disposal (EOD) unit or to some other qualified agency for determination of its type and hazard. An X-ray examination by an activity qualified to do this work will provide information on a projectile's internal construction that may aid in its identification and indicate the degree of hazard that attends its handling; however, an X-ray examination alone will not indicate the specific type of filler.

c. Removal of an unidentified projectile from its cartridge case, or its disassembly, is hazardous and must not be attempted by unauthorized personnel.

d. Explosive projectiles that have been fired and have failed to function are especially hazardous, since the fuze may be armed and sensitive to shock or jarring. This is true even of fired projectiles of World War II vintage. Fired projectiles can be recognized by the rifling marks engraved into the rotating band. Such projectiles should be left in place, marked or guarded, and reported <u>immediately</u> to police or EOD personnel for disposition. If <u>any</u> question whatever exists as to its hazard, the projectile should be considered <u>dangerous</u> and <u>reported</u>.

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SECTION III

CARTRIDGE IDENTIFICATION DATA

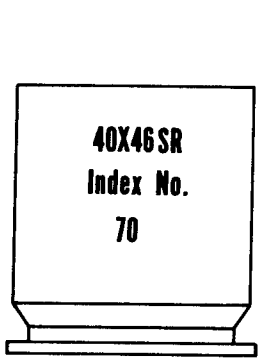
A. CARTRIDGE-CASE OUTLINE DRAWINGS

1. General

Cartridge-case outlines are presented in this section in sequence of case length, as indicated by the second element of the metric designation. These drawings will be found particularly useful for identifying fired cartridge cases with dented or deformed mouths, which may prevent ready measurement of the case-mouth diameter.

2. Use

Because of space limitations, the outline drawings are reduced in scale. Cartridge cases 200 mm and less in length are shown at 75% of full size, while cases over 200 mm in length are shown at 45% of full size. Provided that the case length is known and the cartridge caliber can be estimated, these drawings can be used for a rapid preliminary identification from the case proportions, shoulder taper, and cartridge base type; this identification will frequently suffice when there is little likelihood of confusion between cartridge types. A tentative identification can be confirmed by reference to the dimensional data that appear in table I, following the outline drawings. Further information and background data on the cartridge's origin and development, and weapons in which it is used, appear in part B of section III. The index number that appears on each cartridge-case drawing can be used to locate a specific cartridge in table I or in section III, part B.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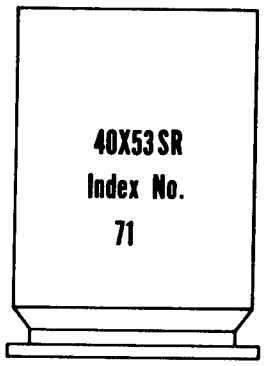
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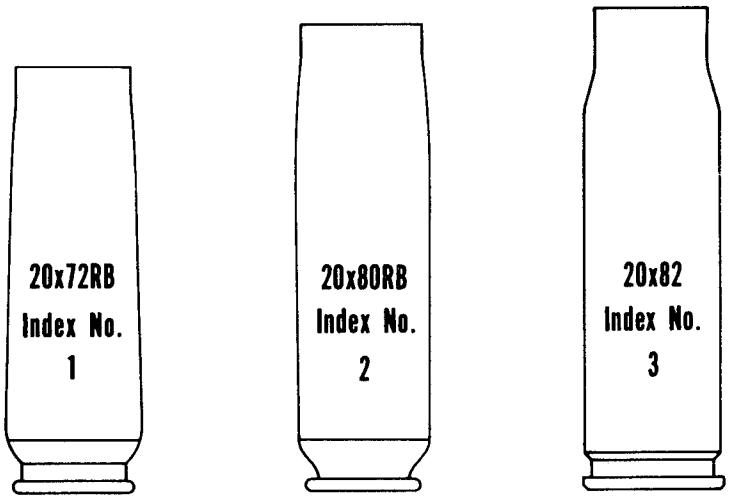
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Index No.
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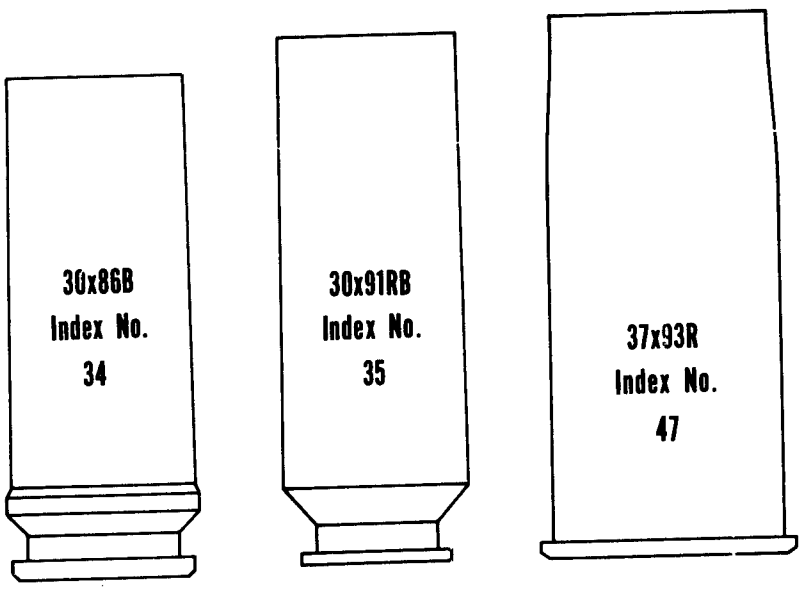
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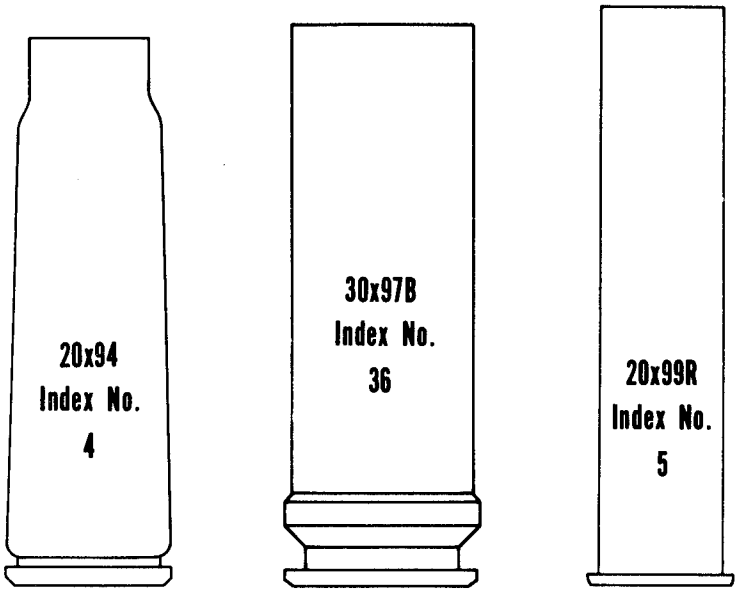
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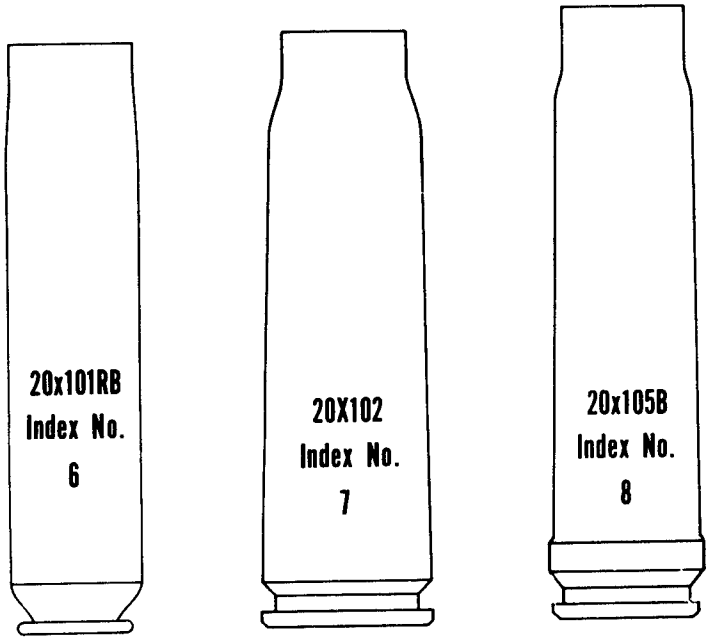
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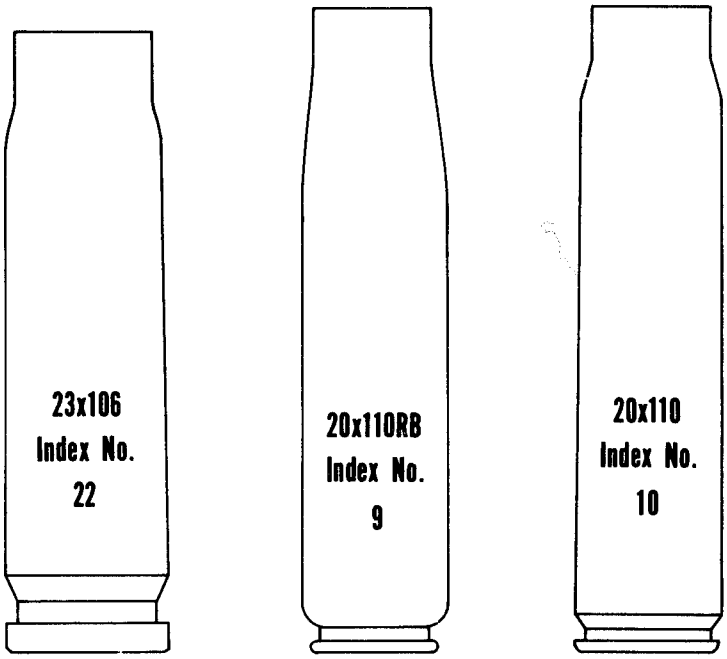
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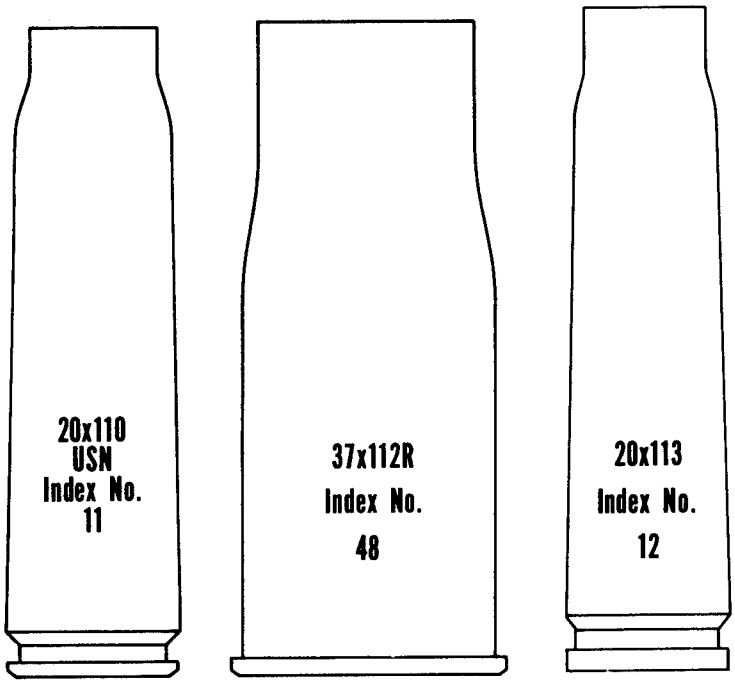
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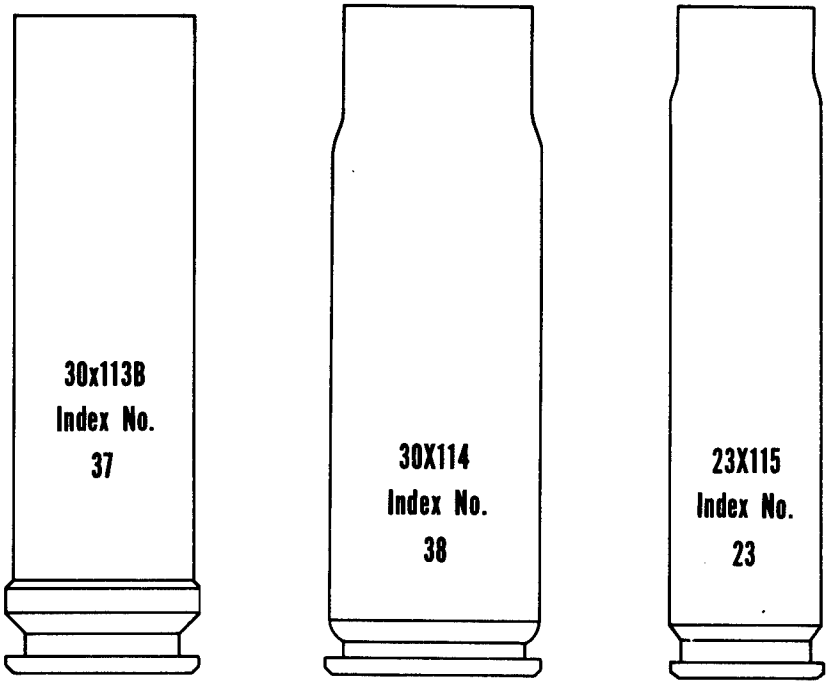
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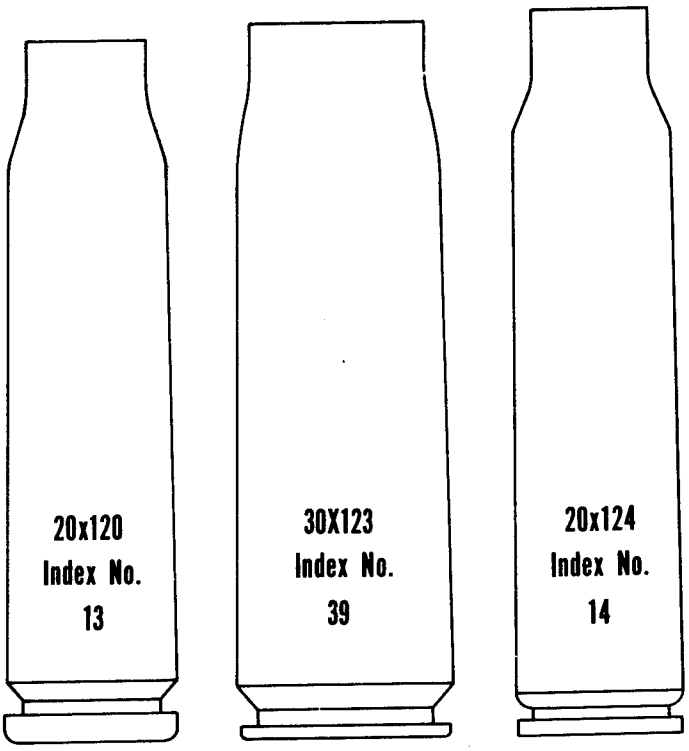
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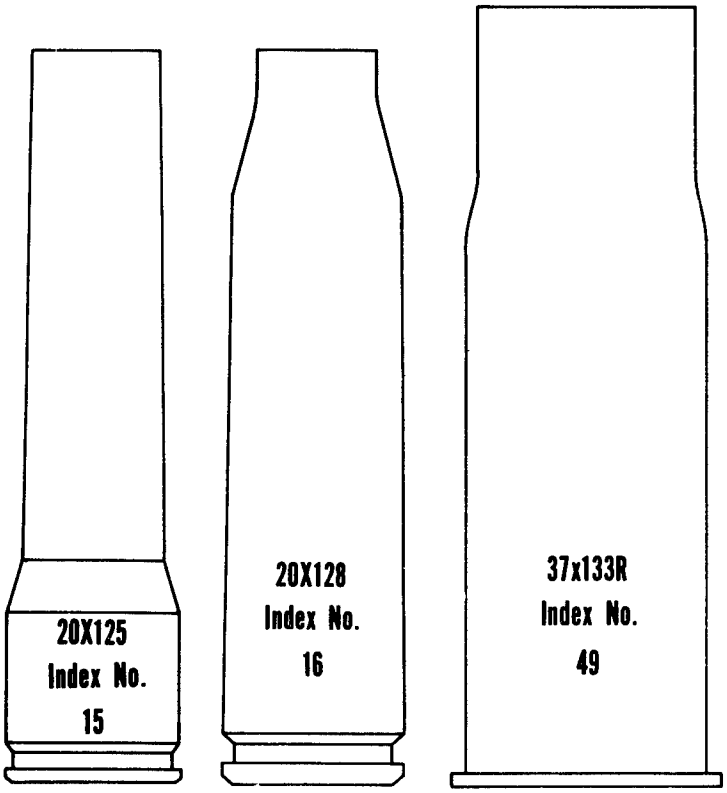
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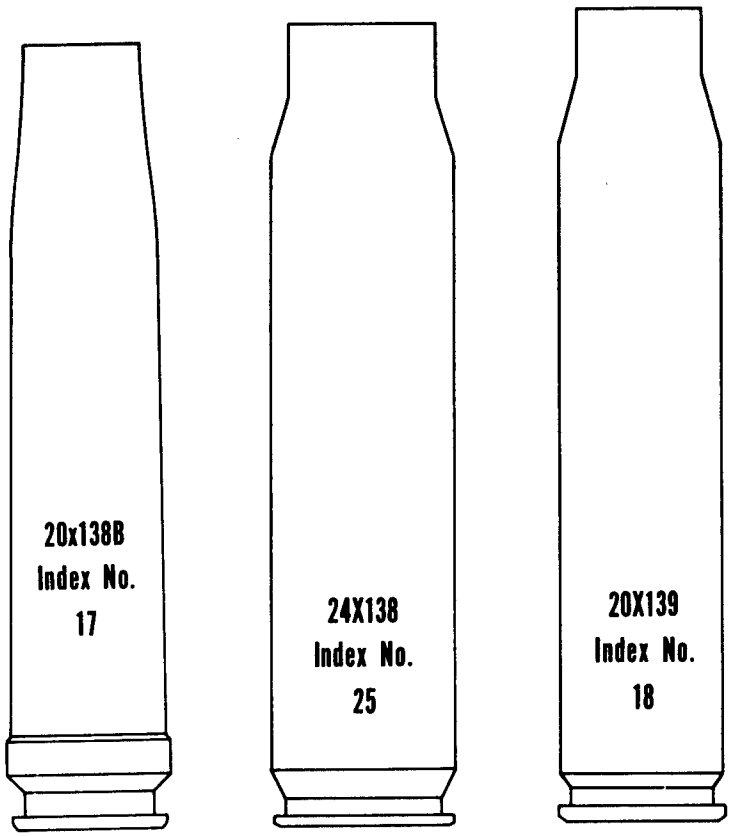
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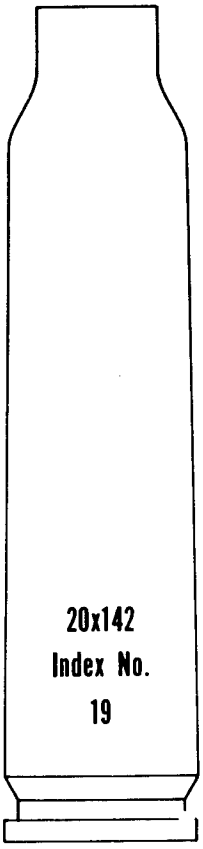
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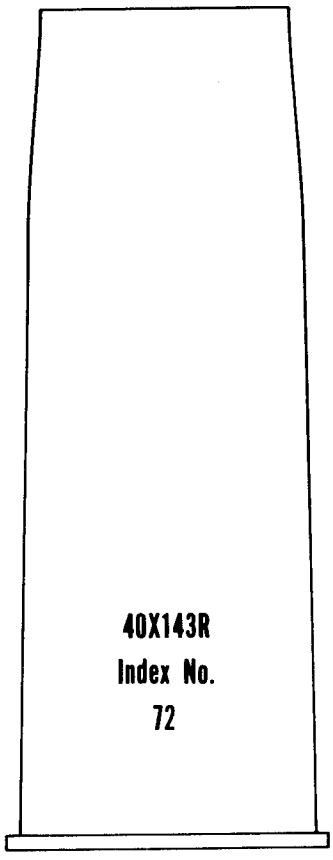
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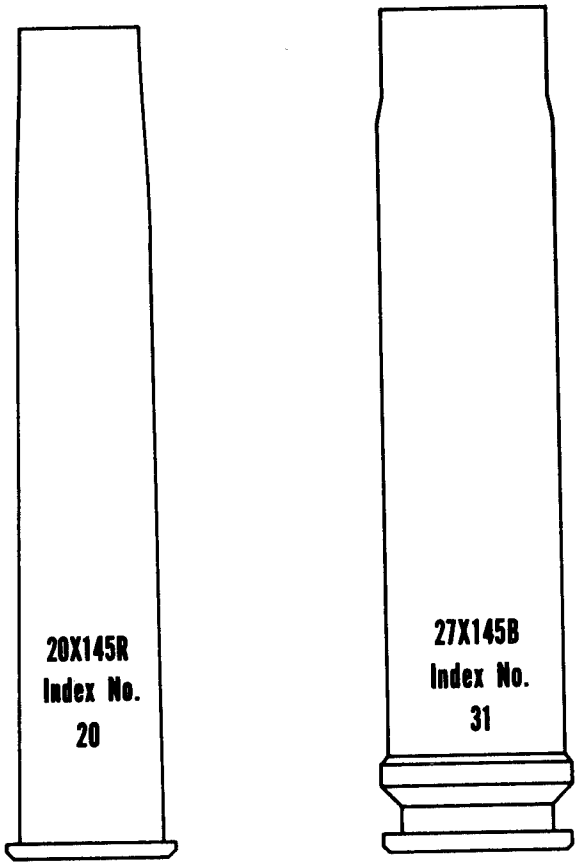
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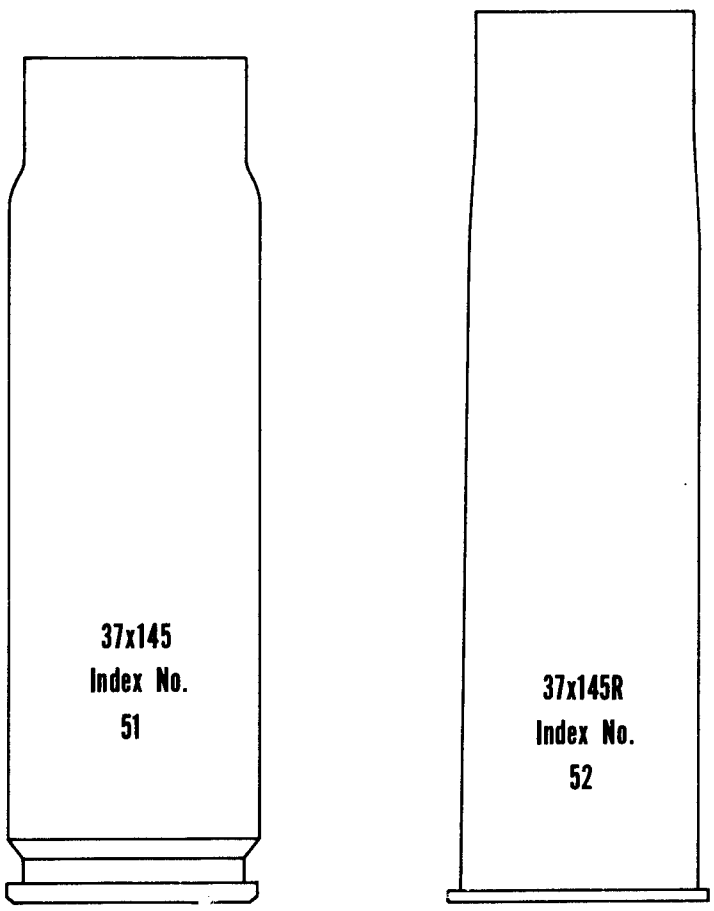
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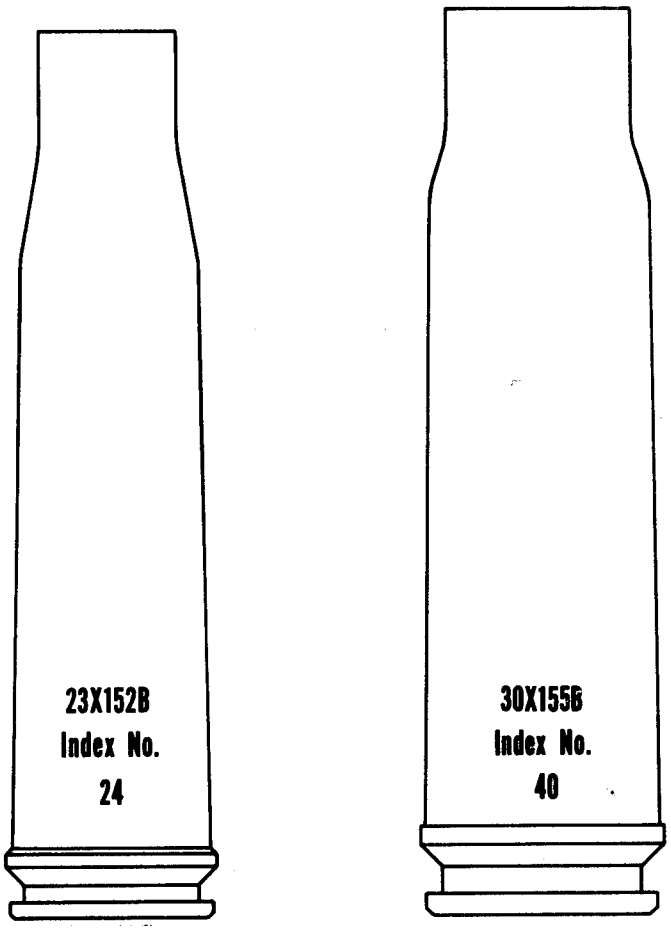
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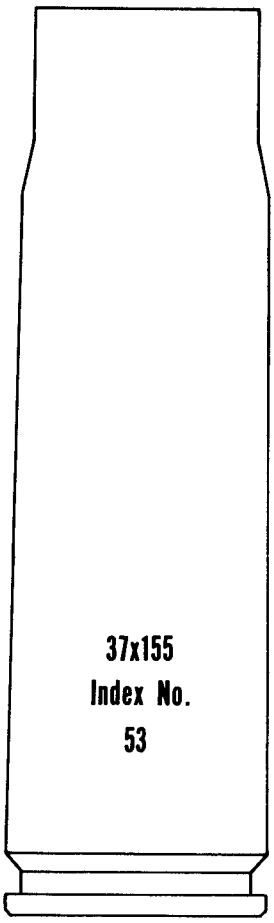
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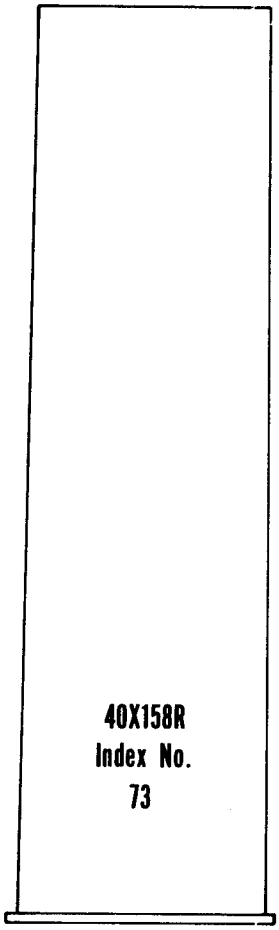
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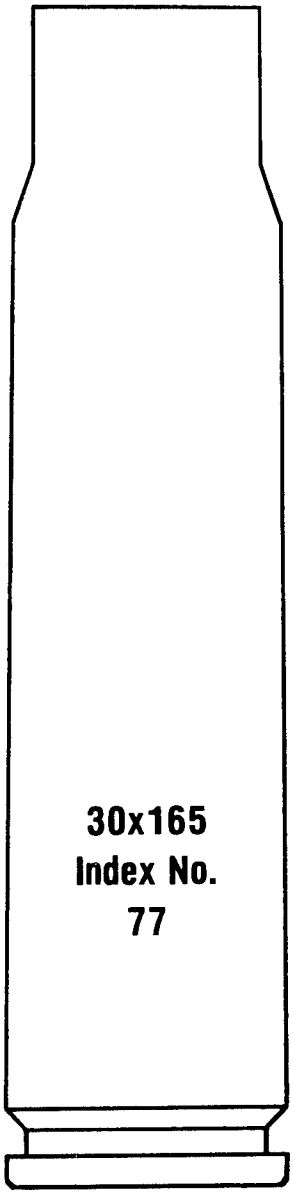

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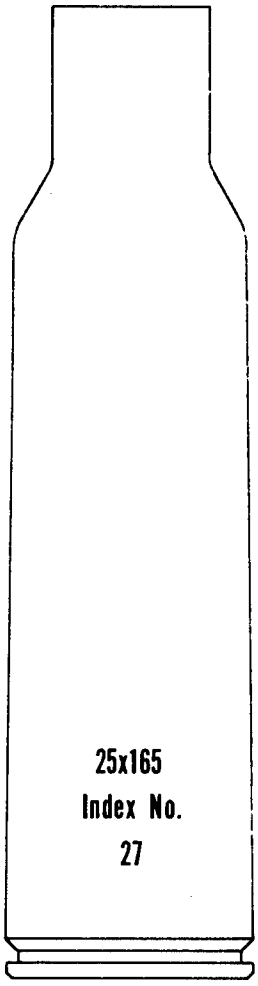
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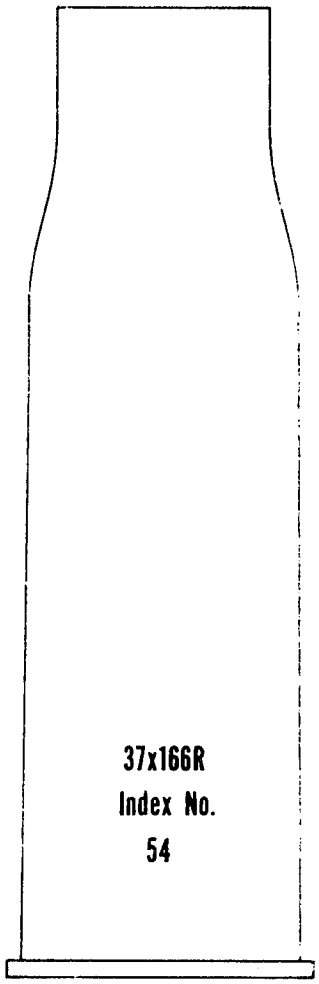
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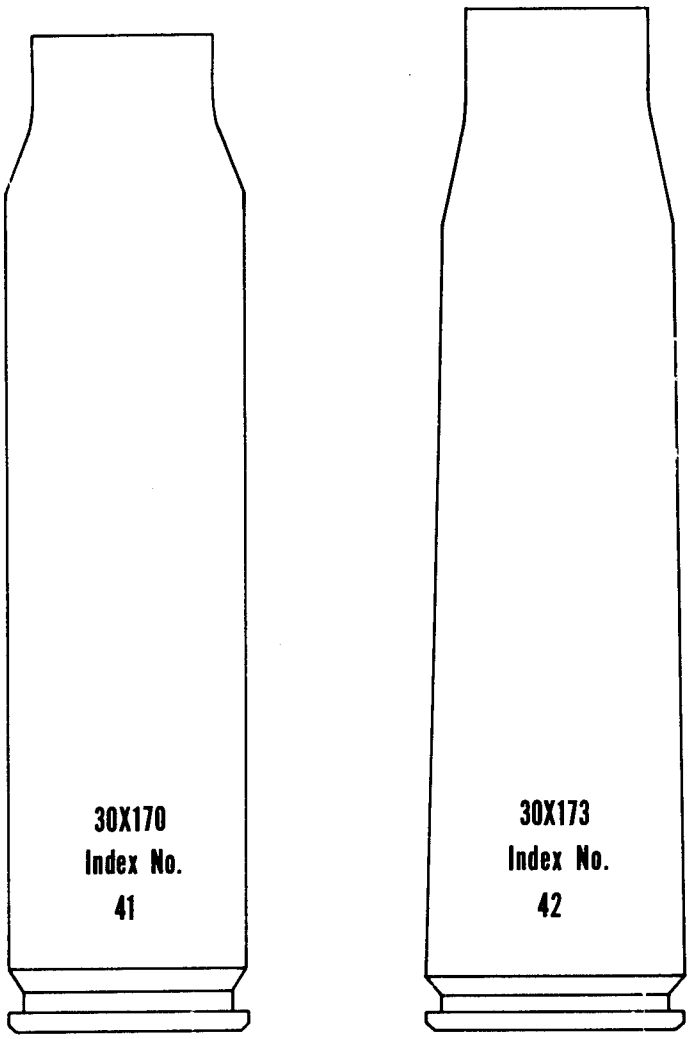
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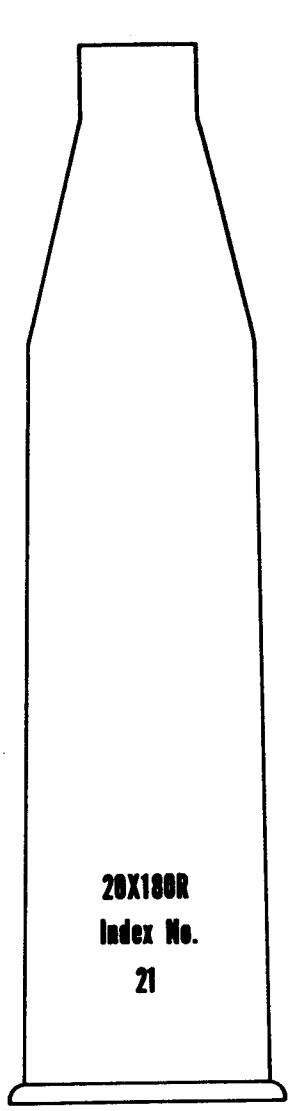
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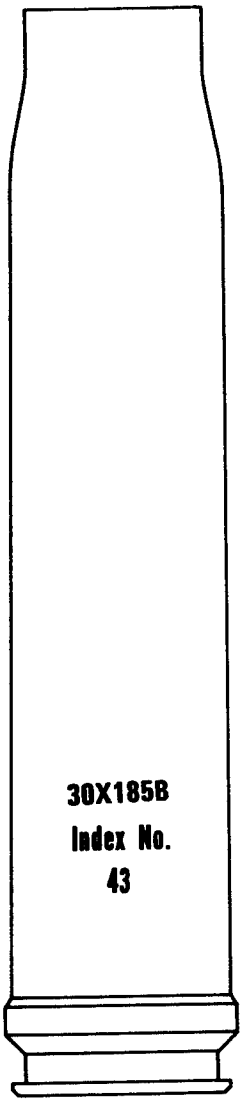
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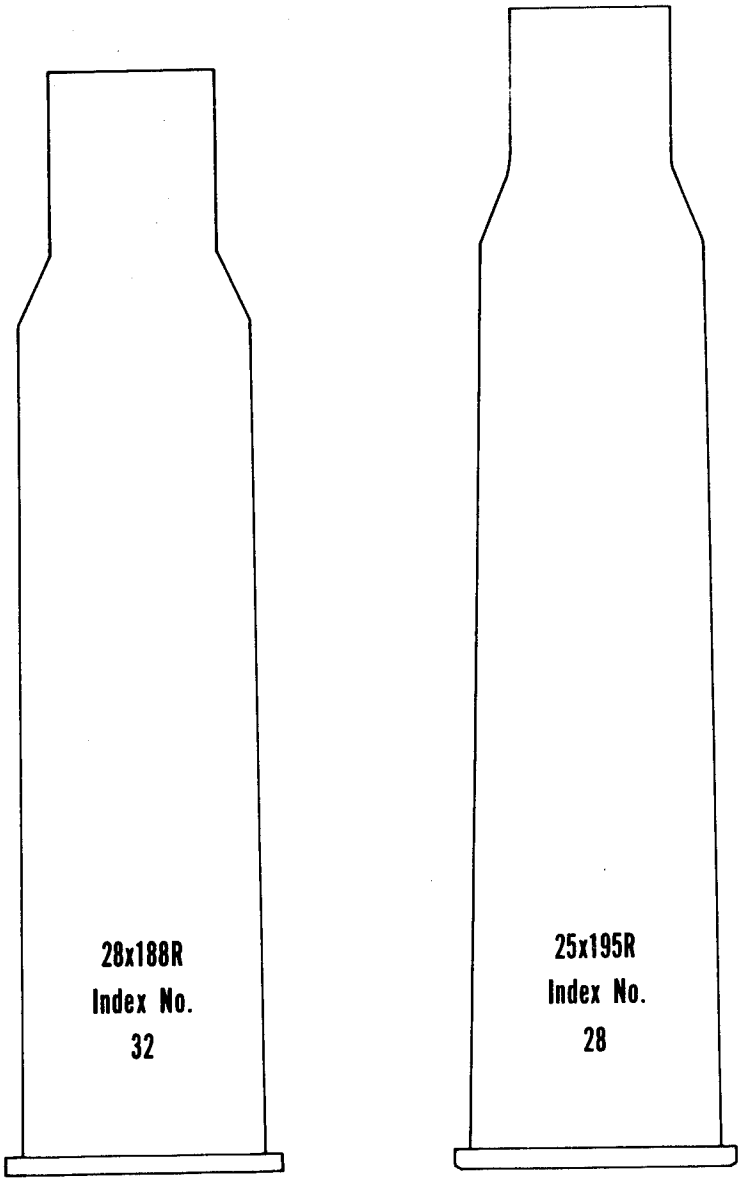
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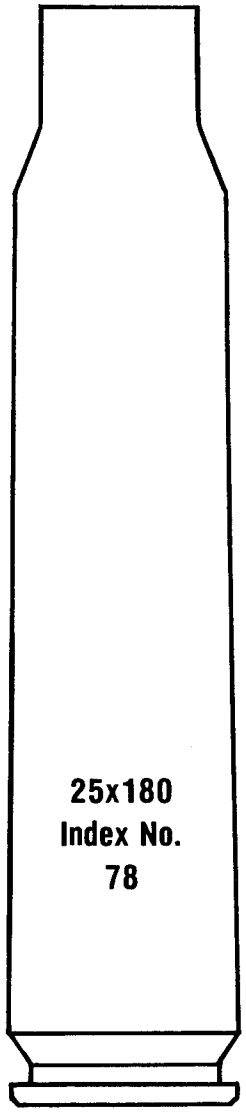

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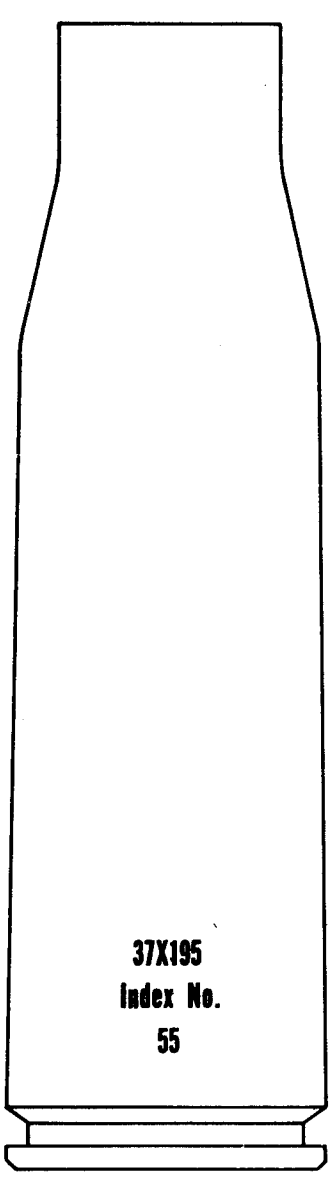
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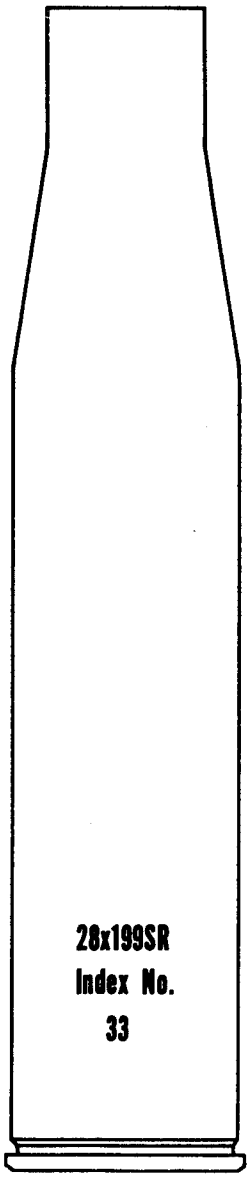
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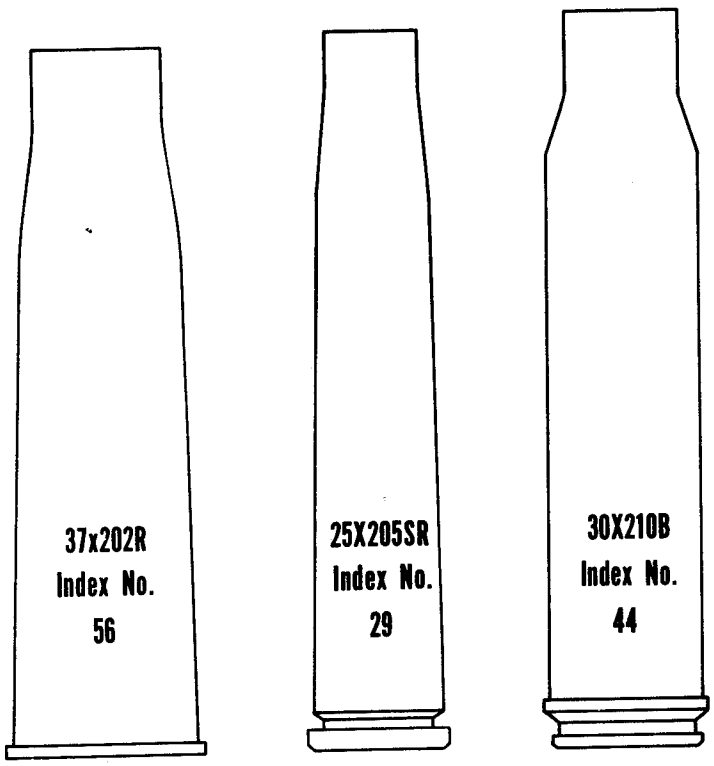
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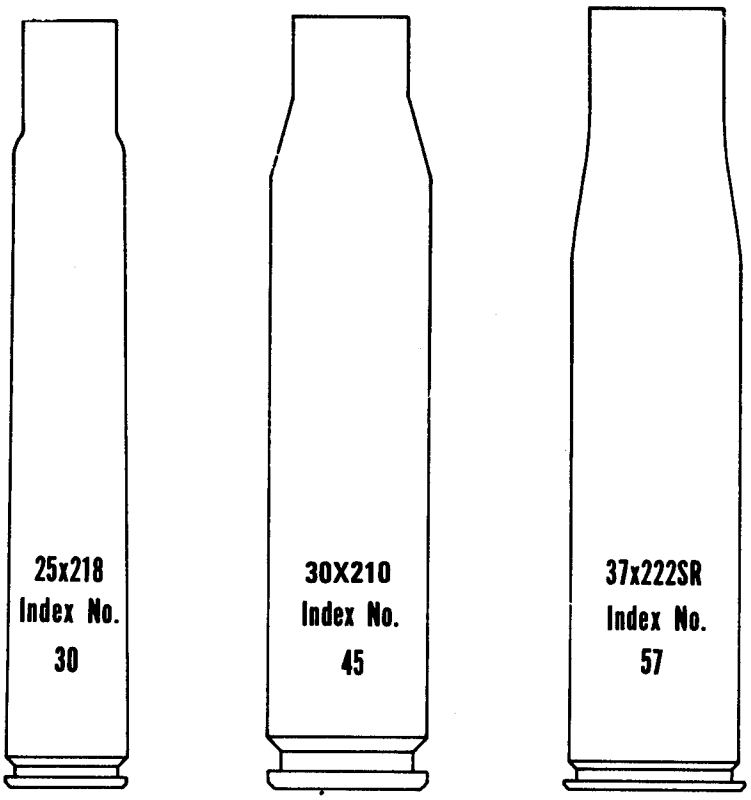
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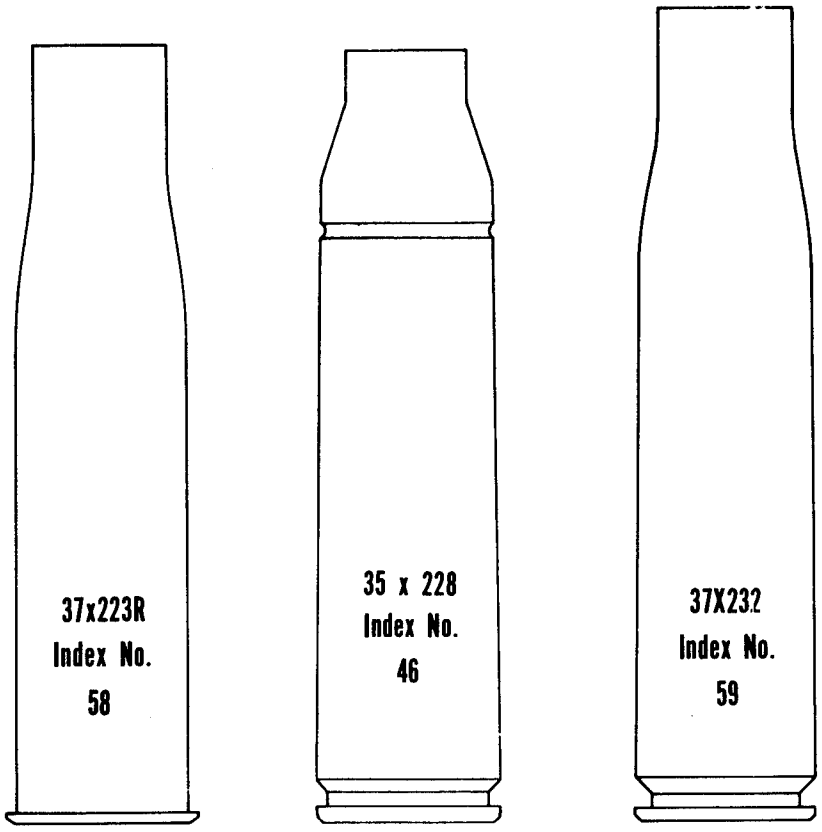
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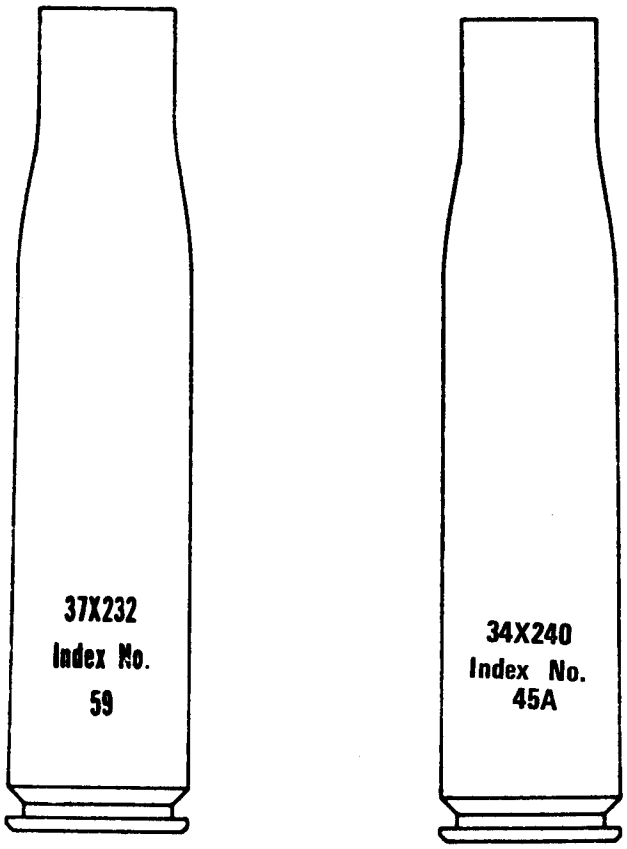
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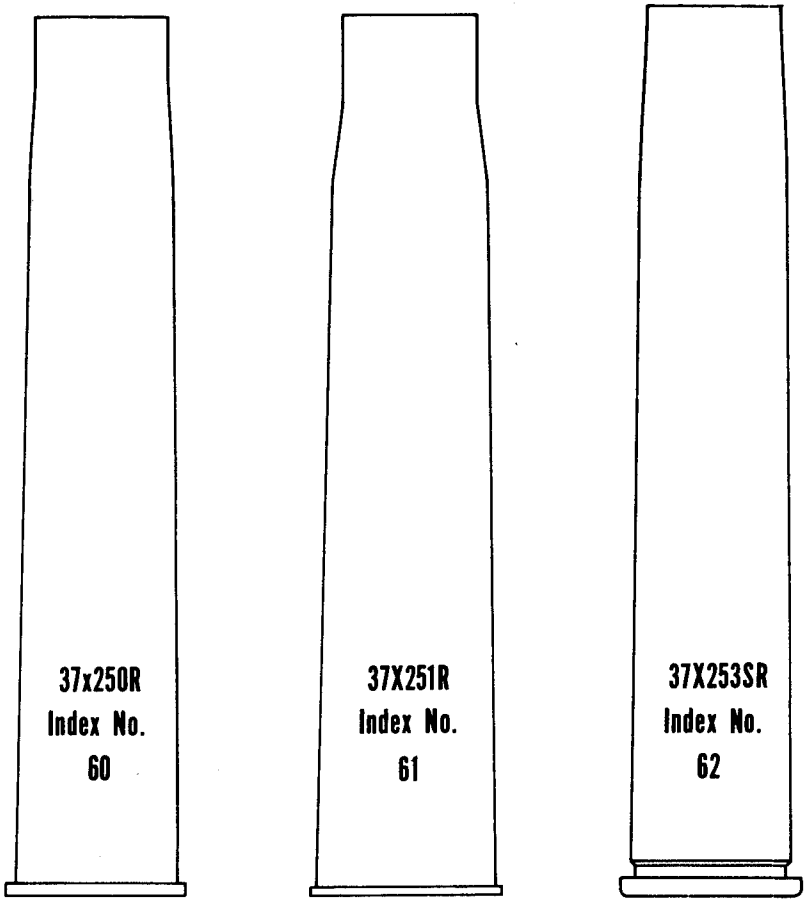
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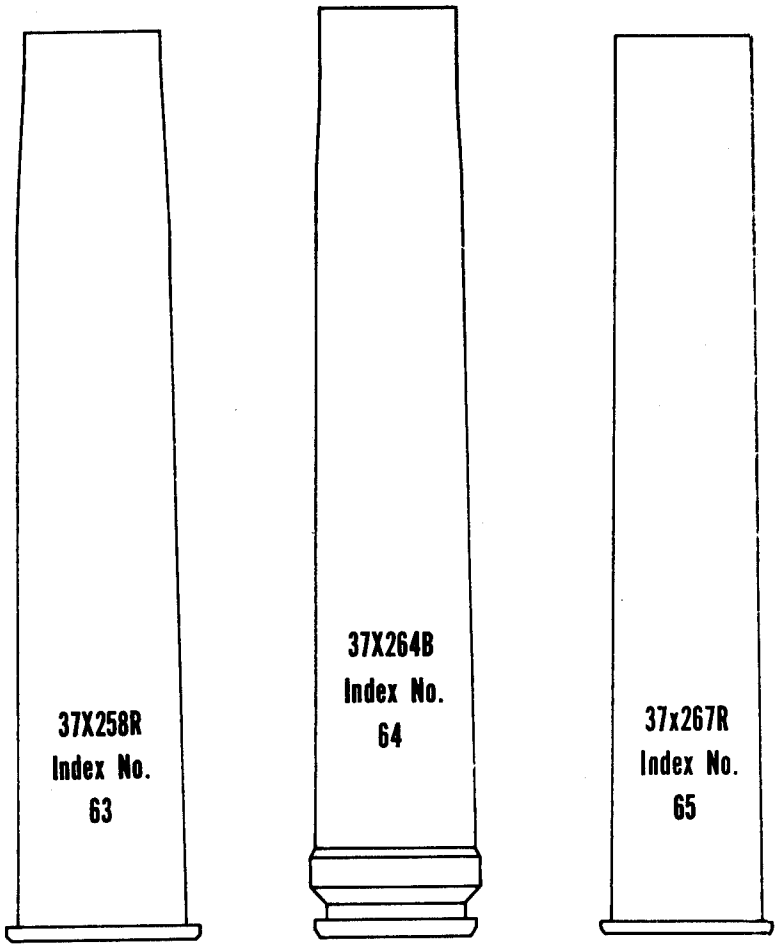
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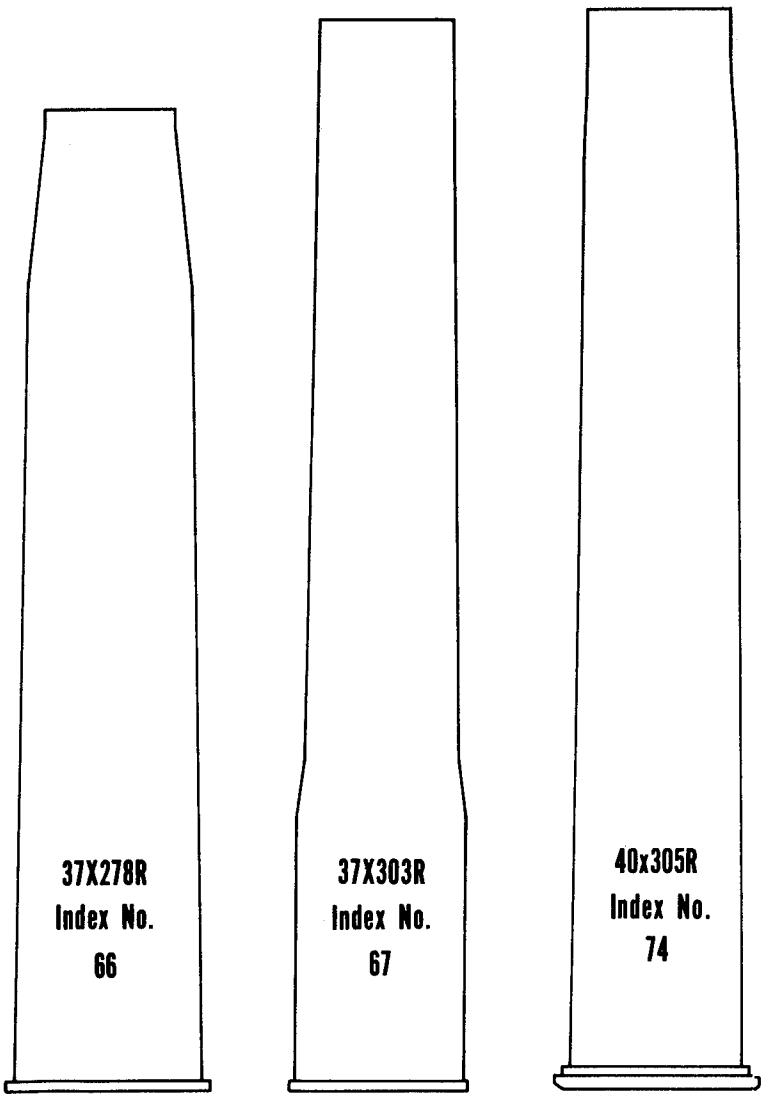
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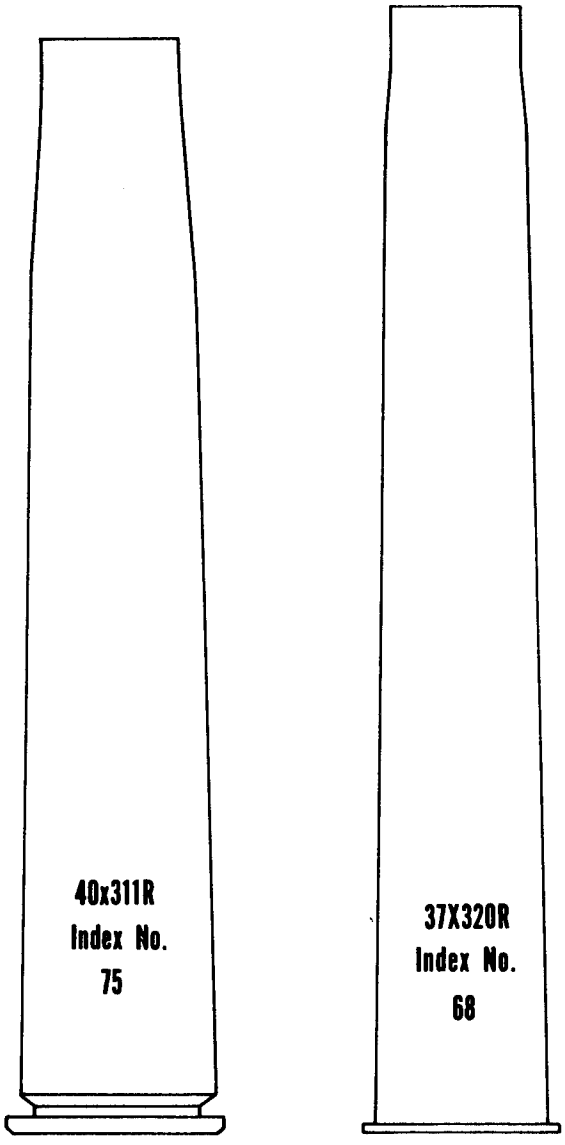
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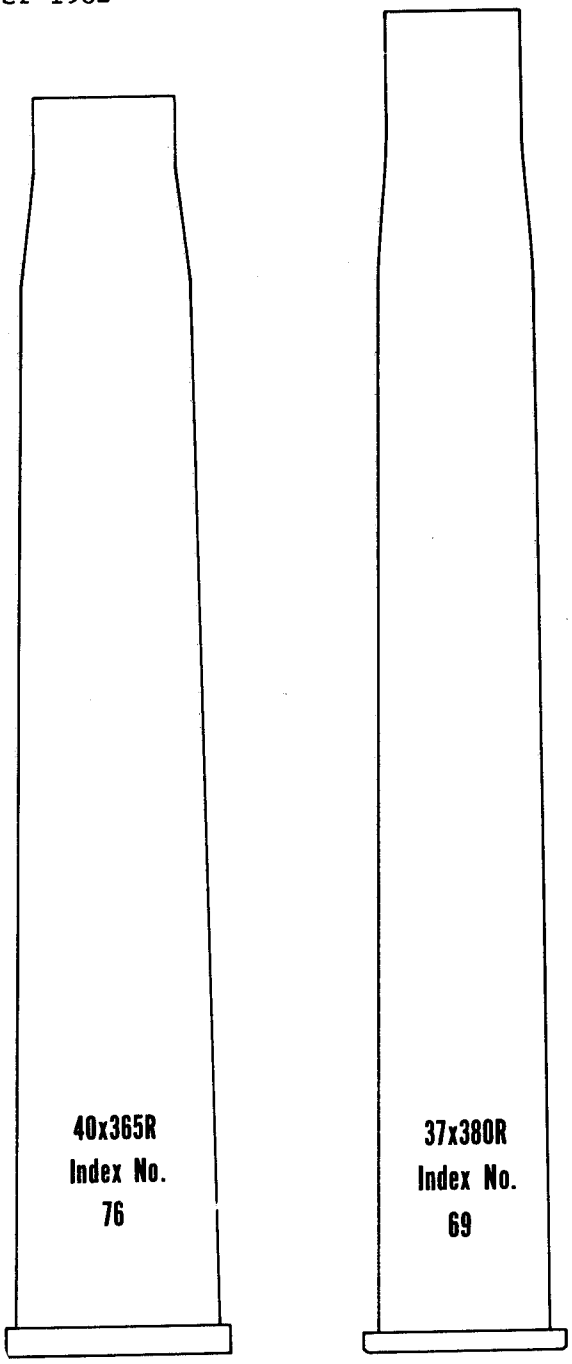
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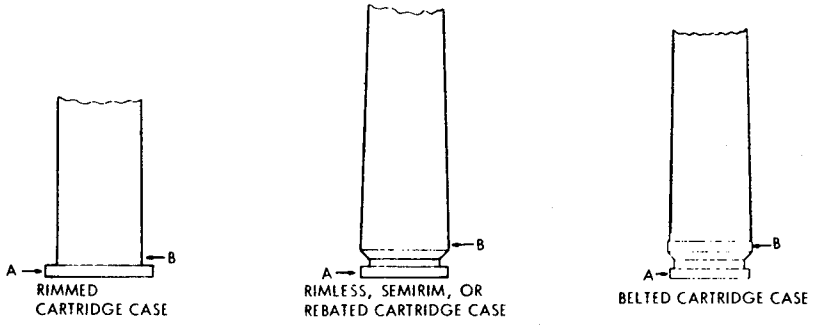
B. DIMENSIONAL AND REFERENCE DATA

3. Dimensional Data

a. Table I provides dimensional data on each of the cartridges covered in this guide. Cartridges are listed in order of their increasing caliber and by increasing case length within caliber. The index number aids in rapid cross-indexing between the case outline drawings and the cartridge reference data in paragraph 2.

b. Dimensions indicated in table I for "rim diameter" and "head/belt diameter" are measured at points A and B respectively, as shown in figure 6.



Neg. 524948
Figure 6. Location of Rim and Head Measurements

Table I. 20- to 40-mm Cartridge Data
(Dimensions are in Millimeters)

Index No.	Designation	Cartridge case dimensions						Projectile bourrelet diameter	Cartridge length	Primer type	Country of origin or use	Notes
		Case type	Case length	Rim diameter	Head/belt diameter	Shoulder diameter	Mouth diameter					
1	20x72RB	Rebated	72.0	19.0	22.4	21.0	20.6	19.9	137-144	P	Switzerland	
2	20x80RB	Rebated	80.0	19.2	22.2	---	20.7	19.9	146	P	Switzerland	
3	20x82	Rimless	81.7	25.1	25.0	23.7	20.7	19.9	147	P or E	Germany	1
4	20x94	Rimless	94.0	24.8	25.0	23.7	21.0	19.9	147	P	Japan	
5	20x99R	Rimmed	98.9	25.2	21.9	---	20.7	19.8	147	P	USSR	
6	20x101RB	Rebated	101.0	19.0	22.1	21.1	20.6	19.8	174	P	Switzerland	
7	20x102	Rimless	102.0	29.5	29.2	26.6	20.6	19.9	168-174	E	United States	
8	20x105B	Belted	105.0	25.0	26.3 (belt)	23.8	20.7	19.9	170	P	Switzerland	
9	20x110RB	Rebated	109.8	22.2	24.7	23.9	20.6	19.9	181	P	Switzerland	
10	20x110	Rimless	110.1	24.5	24.9	23.9	20.6	19.9	184	P or E	Switzerland	2,3
11	20x110 (USN)	Rimless	109.5	29.5	29.0	26.1	20.6	19.9	185	E	United States	3
12	20x113	Rimless	112.7	28.0	28.0	23.7	20.9	19.9	172-176	P	Finland	4
13	20x120	Rimless	119.5	29.0	29.0	26.9	21.0	20.0	186	P	Denmark	4
14	20x124	Rimless	124.5	28.5	28.7	27.4	20.3	19.9	194	P	Japan	
15	20x125	Rimless	124.7	30.4	30.4	30.1	21.2	19.9	206	P	United States	

★Table I. 20- to 40-mm Cartridge Data (Dimensions are in Millimeters) (Continued)

Index No.	Designation	Cartridge case dimensions						Projectile bourrelet diameter	Cartridge length	Primer type	Country of origin or use	Notes
		Case type	Case length	Rim diameter	Head/belt diameter	Shoulder diameter	Mouth diameter					
16	20x128	Rimless	128.7	32.0	32.2	30.0	21.2	19.9	203	P or E	Switzerland	
17	20x138B	Belted	137.6	26.8	28.5 (belt)	25.5	20.8	19.9	205	P	Switzerland	
18	20x139	Rimless	138.5	28.4	28.5	27.5	21.5	19.9	213	P	Switzerland	
19	20x142	Rimless	142.0	33.4	33.4	31.5	20.5	19.8	213	P	Japan	
20	20x145R	Rimmed	145.0	29.5	25.4	23.0	21.0	20.0	197-222	P	Sweden	4
21	20x180R	Rimmed	180.0	47.9	42.6	39.0	20.8	20.0	232-235	P	Sweden	5
22	23x106	Rimless	106.0	29.0	29.0	27.0	23.8	22.8	186	P	Denmark	4
23	23x115	Rimless	114.5	26.8	26.9	26.0	23.9	22.8	200	P	USSR	
24	23x152B	Belted	151.0	33.2	34.6 (belt)	30.5	23.9	22.8	235	P	USSR	6
25	24x138	Rimless	138.4	31.4	32.4	31.1	25.2	23.8	210	P	Switzerland	
26	25x137	Rimless	136.5	37.8	38.0	35.5	26.1	24.8	223	P	Switzerland,US	7
27	25x165	Rimless	164.5	42.8	43.0	40.0	27.6	25.5	210-232	P	France	
28	25x195R	Rimmed	193.5	47.2	42.7	38.9	26.5	25.6	262	P	France	8
29	25x205SR	Semi-rimmed	204.5	42.0	36.9	31.5	25.7	24.9	282	P	USSR	
78	25x180	Rimless	182.0	38.0	38.4	35.1	26.6	26.8	287	P	Switzerland	

★Table I. 20- to 40-mm Cartridge Data (Dimensions are in Millimeters) (Continued)

Index No.	Designation	Cartridge case dimensions						Projectile bourrelet diameter	Cartridge length	Primer type	Country of origin or use	Notes
		Case type	Case length	Rim diameter	Head/belt diameter	Shoulder diameter	Mouth diameter					
30	25x218	Rimless	218.7	34.9	34.8	31.0	26.1	24.7	292	P	USSR	
31	27x145B	Belted	145.0	34.1	34.5	31.7	28.7	27.0	239-243	E	West Germany	
32	28x188R	Rimmed	187.9	48.0	42.3	40.0	30.2	28.7	220	P	Germany	
33	28x199SR (1.1-in USN)	Semi-rimmed	198.5	43.5	41.5	40.4	29.0	27.8	308	P	United States	
33A	30x29B	Belted	28.5	31.0	36.0 (belt)	---	31.1	29.8	136	P	USSR	
34	30x86B	Belted	86.0	33.4	33.7 (belt)	---	31.1	29.9	200	E	Germany	9
35	30x91RB	Rebated	89-91	26.0	32.4	---	31.0	29.9	204	P or E	Germany	
36	30x97B	Belted	96.1	33.2	33.8 (belt)	---	31.0	29.8	198	E	France	
37	30x113B	Belted	112.0	33.3	33.8 (belt)	---	30.9	30.0	200	E	France, United Kingdom	10
38	30x114	Rimless	113.5	37.5	38.0	37.0	31.5	30.0	191	P	Japan	
39	30x123	Rimless	122.2	38.4	38.4	36.0	31.4	30.0	206	P	Japan	
40	30x155B	Belted	155.0	40.0	41.5 (belt)	37.0	31.8	29.8	265	P	USSR	
77	30x165	Rimless	165.0	39.9	39.9	38.0	31.9	31.0	291	P or E	USSR	
41	30x170	Rimless	170.0	42.9	42.9	41.5	31.5	29.8	284	P	Switzerland	

Table I. 20- to 40-mm Cartridge Data (Dimensions are in Millimeters) (Continued)

Index No.	Designation	Cartridge case dimensions						Projectile bourrelet diameter	Cartridge length	Primer type	Country of origin or use	Notes
		Case type	Case length	Rim diameter	Head/belt diameter	Shoulder diameter	Mouth diameter					
42	30x173	Rimless	173.0	44.0	44.0	39.4	31.5	29.9	288-290	P or E	Switzerland,US	11,12
43	30x185B	Belted	184.0	38.0	39.5 (belt)	35.6	30.8	29.9	298	P or E	Germany	13
44	30x210B	Belted	210.0	46.0	47.5 (belt)	43.7	32.2	29.8	305	E	USSR	
45	30x210	Rimless	210.0	48.0	48.0	44.5	31.6	30.0	345?	P	Czecho-slovakia	
45A	34x240	Rimless	240.0	47.9	47.9	45.6	35.5	34.1	365	P	Switzerland	
46	35x228	Rimless	227.5	54.6	55.0	52.0	35.8	35.0	387	P	Switzerland	14
47	37x93R	Rimmed	92.4	44.0	40.1	39.4	37.8	37.0	176-228	P	United States	14
48	37x112R	Rimmed	111.5	47.0	44.0	43.0	37.9	36.7	197-221	P	Japan	
49	37x133R	Rimmed	133.0	47.0	43.2	42.0	38.2	37.0	228	P	Japan	
50	37x137R (1-pdr USN)	Rimmed	136.9	45.0	39.4	38.8	37.1	37.0	206	P	United States	
51	37x145	Rimless	144.0	43.5	43.2	43.0	38.5	37.0	225-246	P	Japan	
52	37x145R	Rimmed	144.5	45.0	41.5	39.3	37.2	37.0	237-248	P	United States	16
53	37x155	Rimless	154.5	45.9	45.7	43.0	39.0	36.8	286	P	USSR	
54	37x166R	Rimmed	166.3	54.0	49.6	46.8	38.2	36.9	266	P	Japan	
55	37x195	Rimless	195.0	54.4	54.4	51.0	37.8	36.8	325	P	USSR	

Table I. 20- to 40-mm Cartridge Data (Dimensions are in Millimeters) (Continued)

Index No.	Designation	Cartridge case dimensions						Projectile bourrelet diameter	Cartridge length	Primer type	Country of origin or use	Notes
		Case type	Case length	Rim diameter	Head/belt diameter	Shoulder diameter	Mouth diameter					
56	37x202R	Rimmed	202.0	58.0	53.5	47.0	38.3	36.5	322-328	P	Italy	
57	37x222SR	Semi-rimmed	222.0	51.7	50.0	49.0	37.9	37.0	327	P	United States	
58	37x223R	Rimmed	222.3	55.6	50.0	48.6	38.1	37.0	332-369	P	United States	
59	37x232	Rimless	232.0	51.5	50.0	48.7	38.1	36.7	369	P	Italy	
60	37x250R	Rimmed	250.0	51.5	46.0	41.3	38.5	36.75	343-354	P or E	Germany	17
61	37x251R	Rimmed	250.2	54.0	49.6	44.5	38.5	36.9	333-354	P	Japan	
62	37x253R	Rimmed	252.2	52.0	46.0	41.5	38.5	36.9	384	P	USSR	
63	37x258R	Rimmed	257.0	56.1	49.9	43.0	38.5	36.93	369	P	Poland, Sweden	18
64	37x264B	Belted	264.0	46.8	48.6 (belt)	41.0	38.7	36.9	314-370	P		
65	37x267R	Rimmed	267.0	47.8	44.0	—	38.8	36.8	414	P	Czecho-slovakia	18
66	37x278R	Rimmed	278.0	?	?	?	?	?	400-420	P	France	
67	37x303R	Rimmed	303.4	50.3	46.8	46.4	38.9	36.9	407	P	United States	

Table I. 20- to 40-mm Cartridge Data (Dimensions are in Millimeters) (Continued)

Index No.	Designation	Cartridge case dimensions						Projectile bourrelet diameter	Cartridge length	Primer type	Country of origin or use	Notes
		Case type	Case length	Rim diameter	Head/belt diameter	Shoulder diameter	Mouth diameter					
68	37x320R	Rimmed	320.0	56.1	50.0	40.7	37.5	36.9	431-448	P	Sweden, Denmark	
69	37x380R	Rimmed	380.0	57.9	52.5?	44.5	39.4	36.8	515	P	Germany	
70	40x46SR	Semi-rimmed	46.0	43.5	41.0	---	41.0	40.0	64-133	P	United States	
71	40x53SR	Semi-rimmed	53.0	43.5	41.0	---	40.8	40.6	111	P	United States	
72	40x143R	Rimmed	143.0	?	?	?	?	?	291	P	Italy	
73	40x158R	Rimmed	157.7	48.1	44.0	41.8	41.0	39.9	263-294	P	United Kingdom	
74	40x305R (2-pdr AT gun)	Rimmed	305.0	57.5	51.5	---	40.8	39.9	417	P	United Kingdom	
75	40x311R	Rimmed	311.0	62.0	56.0	48.0	41.5	39.9	447-480	P	Sweden	
76	40x365R	Rimmed	365.0	65.0	57.8	48.0	41.5	39.9	534	P	Sweden	

NOTES

1. Electric-primed as well as percussion-primed cartridges were used by Germany in World War II; electric-primed cases are identified by a brass-clad steel cartridge case instead of lacquered steel, and by the electric primer, Model P-2.

2. Electric-primed cartridges are used only in US M24 and M24Al guns; percussion-primed cartridges are used in the US M3 gun, and in all Hispano-Suiza HS 404 and HS 804 guns.

3. Differences in case dimensions and in performance prevent interchangeability of electric-primed 20x110 cartridges for M24-series guns and Mk 11 and Mk 12 guns.

4. Cartridges for the Lahti 20x113 aircraft gun, the Swedish 20x145R antiaircraft (AA) gun, and for Madsen 20-mm and 23-mm automatic guns, have an exceptionally thick extracting rim, approximately 4 mm thick.

5. The cartridge case has a blow-out venturi in its base, for use in recoilless rifles.

6. Cartridges for obsolete VYa aircraft guns and for tank subcaliber guns have brass cases. Cartridges for ZU-23 and ZSU-23-4 AA guns have steel cases. Despite their dimensional similarity, the steel-case and brass-case cartridges are not functionally interchangeable.

7. The 25x137-mm cartridge case has an annular link-positioning groove located 98.5 mm from the base of the case.

8. Also made in a rimless version for a semiautomatic antitank (AT) gun.

9. In postwar trials with improved revolver-type cannon based on the Mauser MK-213 design, the United States produced experimental cartridge cases in lengths from 86 mm to 126.5 mm. Two types were produced in quantity: the 30x100B case for the WECOM 30 gun and the 30x126.5B cartridges for T182 and T212 guns. (See table VI for data on US experimental 30-mm belted cartridges.)

10. Cartridge cases for the United Kingdom's ADEN gun are of brass, with identification data stamped in the bottom of the extraction groove. Cases for DEFA guns are of steel, normally lacquered. The United States is developing aluminum-cased 30x113B cartridges that will be compatible with ADEN and DEFA guns.

11. Cartridges for Oerlikon 304RK (KCA) guns are all electric-primed, with lacquered steel or anodized aluminum cases. This cartridge case has also been used by the United States in GAU 8A and GAU 9A gun system trials. US-made cases are anodized aluminum, with electric primers for the GAU 9A gun and percussion primers for the GAU 8A gun. Percussion-primed 30x173 cartridges are not interchangeable with 30x170 cartridges.

12. A similar cartridge, but with a longer case neck and a case length of 178 mm to 180 mm, was made by Oerlikon in 1953-1954 for the 302RK aircraft gun. This gun and ammunition were not produced in significant numbers; the 302RK was soon replaced by the 304RK gun.

13. Cartridges for the German World War II aircraft gun MK 101 have percussion primer C/33; cartridges for the MK 103 gun use electric primer C/23. Cartridges can be distinguished by the stamped model designation on the primer; they are otherwise identical but, because of the primer, not interchangeable.

14. The 35x228 cartridges for Oerlikon KDA, GDP (5PF-2), and GDM-C guns have an annular link-positioning groove in the cartridge case, 176 mm from the base, to accommodate the feed belt used with these guns. Cartridges for other gun models do not have this groove. Cartridges are otherwise identical, and cartridges with link-positioning may be used in any model gun chambered for this cartridge.

15. Several similar foreign cartridges were made, none of which is now in use. Among these were a German M1897 howitzer cartridge; the French World War I 37/85 cartridge, with a case length of 94.5 mm, which is reported to be interchangeable with the US cartridge; and a similar World War I Italian cartridge, designated 37/20.6.

16. Also used in the now-obsolete US 1.457-inch subcaliber gun, Model 1918.

17. Cartridges for the German World War II 3.7-cm PAK (AT gun) have percussion primer C/13 or C/33; cartridges for the 3.7-cm KWK (tank gun) use electric primer C/23. Cartridges can be distinguished by the stamped model designation on the primer. The cartridges are otherwise identical but, because of the primer, not interchangeable.

18. Also made and used by Germany during World War II.

4. Cartridge Reference Data

a. This paragraph presents information on the development, service use, and weight and muzzle velocity of the cartridges listed in table I.

b. It is emphasized that this guide is limited to the identification of cartridges based on the basis of physical characteristics. Dimensional similarity does not imply and will not ensure that a cartridge can be safely fired in, or will properly function in, any weapon other than an appropriately chambered weapon designed to fire that cartridge.

Index No. 1 — 20x72RB

Other Designations: 20-mm Oerlikon Type FF;
20-mm Japanese Type 99, Mark 1.

The 20x72 RB cartridge was developed in the 1920s from a similar cartridge with a slightly shorter case that was used in the German-designed Becker automatic gun late in World War I. This cartridge was used by the successor to the Seebach firm, Werkzeug and Maschinenfabrik Oerlikon, in their Type FF aircraft gun in the 1930s and also in the Oerlikon SSG (Schweres Selbstladegewehr) antitank rifle. During World War II, Japan also made the same cartridge for use in an Oerlikon-type naval aircraft gun, Type 99 Mark 1. The gun and cartridge were obsolete by the end of the war and have not been manufactured since that time.

Characteristics:

Cartridge weight	187-200 g
Projectile weight	125-142 g
Muzzle velocity	550 m/s

Index No. 2 20x80RB

Other Designation: 20-mm Oerlikon Type FFM.

This cartridge was developed by the Oerlikon firm before World War II for use in the Type FFM aircraft gun, as an improvement over the Type FF gun and cartridge. Switzerland also used this cartridge in the SSG antitank rifle. During World War II, Germany also made and used this cartridge in Oerlikon guns. Except for production of 20x80RB cartridges in Spain in 1953, these guns and this cartridge have not been reported in use since the close of World War II.

Characteristics:

Cartridge weight ..... 210 g
Projectile weight ..... 113-130 g
Muzzle velocity ..... 575-600 m/s

Index No. 3 — 20x82

Other Designations: 2-cm Mauser; 2-cm FLAK 38; 20-mm MG 151/20.

This cartridge was designed by Mauser before World War II for use in a 2-cm wheeled antitank gun, as well as the 20-mm MG 151/20 aircraft gun and a 20-mm AA gun, designated FLAK 38. These weapons and ammunition were made and used by Germany during World War II, while Japan made and used both aircraft and AA guns in this caliber. The MG 151/20 gun was made and used by France until the early 1970s. Cartridges are still produced in this caliber by the French firm Manurhin; these cartridges can be recognized by the brass case and the French-style headstamp.

Characteristics:

Cartridge weight	205 g
Projectile weight	112-120 g
Muzzle velocity	720 m/s

Index No. 4 20x94

Other Designation: 20-mm Japanese HO-5 aircraft gun.

Used in the World War II Japanese HO-5 aircraft gun, which was based on a Browning design, this cartridge may have a HEI or AP-T projectile.

The Ma-202 fuzeless HEI projectile, with a PETN charge under the thin brass nose cap, is especially hazardous. The projectile can be recognized by the characters ≈o≈(202) stenciled on the black projectile body. This gun and cartridge were obsolete at the war's end.

Characteristics:

Cartridge weight ..... 212-254 g
Projectile weight ..... 78-120 g
Muzzle velocity ..... 800 m/s (est)

★Index No. 5 — 20x99

Other Designation: 20-mm ShVAK aircraft gun.

Made only by the USSR, this straight-case cartridge was developed early in World War II for the ShVAK aircraft machinegun. HEI-T projectiles may have a K-6 or an A-20 PD fuze; cartridges with API projectiles were also produced. The gun has been obsolete in Soviet service since the early 1950s, but the cartridge is still in use for subcaliber training with the 122-mm howitzer, M-30 and M1938.

Characteristics:

Cartridge weight ..... 182 g
Projectile weight ..... 97 g
Muzzle velocity ..... 860 m/s

Index No. 6 — 20x101RB

Other Designations: 20-mm Oerlikon Type FFL;
20-mm Japanese Type 99, Mark 2

The 20x101RB cartridge was developed by Oerlikon before World War II for use in the Type FFL aircraft gun. During World War II, Japan produced a copy of this gun, designated the Type 99 Mark 2 aircraft gun, for naval use. Japan used both Swiss-made and Japanese-made ammunition in this caliber. This gun and cartridge have not been reported in use since the close of World War II.

Characteristics:

Cartridge weight	218-225 g
Projectile weight	120-132 g
Muzzle velocity	670-700 m/s

Index No. 8 20x105B

Other Designations: 20-mm S 18-100; 20-mm MG-204; 20-mm Short Solothurn.

This cartridge was developed in Switzerland during the 1930s by the Solothurn firm for the S 18-100 antitank rifle, which saw service in the Russo-Finnish war of 1939. The cartridge was also used in the Solothurn S 12-100 aircraft gun and during World War II in the Rheinmetall-designed MG 204, which was used on German seaplanes. Italy and Hungary (as well as Switzerland, Germany, and probably Finland) produced this cartridge during World War II.

The gun and cartridge have been obsolete since the close of World War II.

Characteristics: Not available

Index No. 9 — 20x110RB

Other Designations: 20-mm Oerlikon Type "S"; 20-mm Oerlikon Mk 2, Mk 3, or Mk 4; 2-cm FLAK M28/29 Oerl.

This, the most powerful of the Oerlikon rebated-base 20-mm cartridges, was developed before World War II for the Type "S" AA gun. Oerlikon guns firing this cartridge have been used by many countries, including (during World War II) the United Kingdom, Germany, and the United States, in the Mk 4 naval gun. This gun and its cartridge have been obsolete in the US service since the close of World War II but have remained in use elsewhere. In addition to Germany, the United Kingdom, and the United States, 20x110RB cartridges have been made in Australia, Belgium, Canada, Egypt, France, Hungary, Italy, Switzerland, Spain, and Yugoslavia. The cartridge is still listed as available from producers in Egypt, Greece, Italy, and Yugoslavia.

Characteristics:

Cartridge	232-250 g
Projectile weight	120-135 g
Muzzle velocity	830-900 m/s

Index No. 10 20x110

Other Designations: 20-mm Hispano-Suiza HS 404; 20-mm Hispano-Suiza HS 804; 20-mm for M3 gun; 20-mm for M24 gun (M24A1).

This cartridge was developed by the Swiss firm Hispano-Suiza during the 1930s as a percussion-fired cartridge for the HS 404 and HS 804 aircraft and AA guns.

During World War II, both the United States and the United Kingdom used Hispano-Suiza aircraft guns and made cartridges in this caliber; the US-made gun was designated M3.

This cartridge is still in wide use; in addition to Switzerland, Sweden, Yugoslavia, the United States, and the United Kingdom, this cartridge has been made by Egypt, France, Israel, Italy, Spain, and other countries.

In the postwar period, the United States developed and provided an electric-primed version of this cartridge for the M24 and M24A1 aircraft guns. This variant type, which normally has the word "ELECTRIC" stenciled on the cartridge base, will not function in percussion-fired weapons. The electric-primed case can be recognized by the insulating ring that surrounds the primer cup. The 20x110 cartridge has been replaced in US service by the 20x102 and 20x110 USN cartridges.

Characteristics:

Cartridge weight ..... 252-263 g
Projectile weight ..... 125-140 g
Muzzle velocity ..... 820-880 m/s

Index No. 11 — 20x110 USN

Other Designation: 20-mm Mk 100 Series.

This electric-primed cartridge was developed by the US Navy after World War II for use in Mk 11 and Mk 12 naval aircraft guns. The cartridges are frequently termed "Mk 100 Series" because cartridges in this caliber carry designations Mk 101 through Mk 109. The 20x110 USN cartridge reportedly is made and used by Argentina. Japan has developed an APDS cartridge for use in the 20-mm Vulcan AA gun system.

The 20x110 USN cartridge has the same base diameter as the 20x102 cartridge but a different case length and contour; it is not interchangeable with any other 20x110 cartridge. The guns and cartridge are currently in use.

Characteristics:

Cartridge weight	268 g
Projectile weight	110 g
Muzzle velocity	1012 m/s

Index No. 12 20x113

Other Designation: 20-mm Lahti.

Developed in Finland for the 20-mm Lahti aircraft cannon, which was used in the 1939 Russo-Finnish war, this cartridge saw very limited use. It resembles the Danish Madsen cartridge in having an exceptionally thick case rim but differs in case length.

Characteristics: Not available

Index No. 13 20x120

Other Designation: 20-mm Madsen.

Developed in Denmark in the 1920s and used in the Dansk Industri Syndikat's Madsen 20-mm automatic guns M38 (drum-fed) and aircraft gun M40 (belt-fed), the gun and its ammunition were used by Germany to a limited extent in World War II. Some use in other countries in postwar years up to 1950 is reported. Cartridges were produced in the United Kingdom before and after World War II by Imperial Chemical Industries (Kynoch); before the war by Switzerland, Denmark, and Finland; and before and during the war by Germany. This cartridge can be recognized by its unusually thick case rim.

Characteristics:

	API-T	HE-T (SD)
Cartridge weight	340 g	312 g
Projectile weight	154 g	127.5 g
Muzzle velocity	790 m/s	815 m/s

Index No. 14 20x124

Other Designations: 20-mm Japanese Type 97; 20-mm Japanese HO-1, HO-3.

This cartridge was developed by Japan for use in the Type 97 AT rifle introduced in 1937. The same cartridge case was used with other projectiles in the HO-1 (flexible) and HO-3 (fixed) aircraft guns. A 20x124 aircraft gun cartridge that must be handled with caution is the HEI, Type Ma 201, which contains under the thin nose cap a charge of the PETN explosive that detonates if the nose cap is crushed. The projectile is identified by the black steel projectile body with a red band to the rear of the bourrelet, and an unmarked brass nose cap. The characters 二〇一 (201) are stenciled on the projectile body.

Characteristics:

Cartridge weight	300-322 g
Projectile weight	133-156 g
Muzzle velocity	762 m/s

Index No. 15 20x125

Other Designation: 20-mm "Davy Crockett" spotter.

Developed in the early 1960s as a spotter cartridge for the US "Davy Crockett" M28 light weapon system, this cartridge fires a long fin-stabilized spotter projectile through a smoothbore 20-mm gun mounted under the primary weapon barrel. The cartridge case contains a high-low pressure system to ensure reliable ignition while holding chamber pressure to a proper working level. The cartridge case has two spanner wrench holes in the closing plug in the cartridge base. A stenciled marking on the cartridge case gives caliber and model designations: 20-mm SPOTTER M101.

The projectile has an electric impact fuze that, upon impact, produces flash and smoke of sufficient intensity to be visible at 2000 meters. The "Davy Crockett" weapon system is no longer in use.

Characteristics: Not available

✱Index No. 16 20x128

Other Designations: 20-mm Oerlikon RK 206; RK 251; KAB (5TG); KAA (204 GK).

Designed by the Swiss firm of Oerlikon-Buhrle in the 1950s, this cartridge is made in a percussion-primed version for the 5TG and 204 GK ground guns and in an electric-primed version for the now-obsolete revolver-type aircraft guns RK 206 and RK 251. Cartridges are identical except for the type of ignition. In 1972, when Oerlikon obtained a controlling interest in Hispano-Suiza, the belt-fed 204 GK gun was redesignated KAA, and the magazine-fed 5TG gun was redesignated KAB. Cartridges are produced by the French firm of Luchaire as well as by Oerlikon. The Spanish firm CETME, located in Madrid, now produces electric-primed cartridges in this caliber for the multibarreled MEROKA AA gun.

Characteristics:

Cartridge weight ..... 330-360 g
Projectile weight ..... 122-138 g
Muzzle velocity ..... 1085-1200 m/s

Index No. 17 20x138B

Other Designations: 2-cm Long Solothurn; 2-cm Rheinmetall; 2-cm Lahti AT gun; 2-cm Breda; 2-cm FLAK 30/38.

Developed during the 1930s by the Swiss firm Solothurn AG as an improvement over the 20x105B cartridge, the 20x138B has been used in a variety of AT guns and AA machineguns: The Swiss-designed tank gun S18-1000 and AT gun S18-1100, Italian Breda AT and AA guns, the Finnish Lahti 20-mm AT gun, and the Rheinmetall 2-cm FLAK 30/38 AA gun. Sweden used the Rheinmetall AA gun and the Swiss AT gun under the designation m/39. Cartridges have been produced in Switzerland, Sweden, Germany, Finland, and (before 1941) Greece; they are still offered for sale by Yugoslavia and by Bombrini Parodi-Delfino of Italy. Both brass-cased and steel-cased cartridges are known. Reportedly this cartridge is currently manufactured in Czechoslovakia.

Characteristics:

Cartridge weight ..... 320 g
Projectile weight ..... 148 g
Muzzle velocity ..... 860-900 m/s

★Index No. 18 — 20x139

Other Designations: 20-mm Oerlikon KAD (HS 820 series); 20-mm Rh 202; 20-mm M139.

Hispano-Suiza of Switzerland developed this cartridge at the close of World War II to provide improved performance over that of the 20x110 Hispano-Suiza cartridge. HS 820 guns were widely marketed during the 1950s, and ammunition improvements have kept pace with improved gun models. The same cartridge has been adopted by France for the M693 automatic gun, by Germany for the Rheinmetall Rh 202 gun, and by the United States for the M139 gun. Projectile and fuze designs, designations, and characteristics vary among the producing countries. Cartridges in this caliber are also made in the Netherlands, Norway, Sweden, and Greece.

In the postwar period, Hispano-Suiza developed a 23x139-mm cartridge, based on the 20x139-mm design, for use in the 827C aircraft gun. This gun and ammunition were produced only for testing. In the 1960s, the Mauser firm developed a 23-mm cartridge for the C-1 aircraft gun. Except for the larger-diameter projectile, the cartridge is similar in dimensions and case outline to the 20x139-mm cartridge. No quantity production of this 23-mm cartridge is reported.

Characteristics:

Cartridge weight ..... 317 g
Projectile weight ..... 120 g
Muzzle velocity ..... 1100 m/s

Index No. 19 20x142

Other Designation: 20-mm Japanese Type 98.

This cartridge was introduced in 1938 for Type 98 AA and AT guns. HE-T and AP-T projectiles are known.

Characteristics:

Cartridge weight ..... 396-423 g
Projectile weight ..... 129-156 g
Muzzle velocity ..... 830 m/s

Index No. 20 — 20x145R

Other Designations: 20-mm Bofors m/40;
20-mm Tubkanon.

This ammunition was developed by Bofors for the 20-mm Bofors drum-fed automatic gun, Model m/40, and used also in the m 40/70 gun. While these guns are obsolete, similar cartridges are used in subcaliber 57-mm and 75-mm AT guns and vehicle-mounted 75-mm and 105-mm guns. This gun and ammunition were also used by Denmark under the designation M40S. Data shown are from a Danish manual. Unlike other Bofors cartridges, this cartridge has no annular groove in the cartridge base for the Bofors feed clip.

Characteristics:

	HE-T(SD)	HE-T	AP-T
Cartridge weight	310 g	300 g	300 g
Projectile weight ...	145 g	136 g	136 g
Muzzle velocity	815 m/s	845 m/s	845 m/s

Index No. 21 20x180R

Other Designations: 20-mm m/39.

The large propellant volume of this cartridge results from its use in a recoilless AT gun designated m/42. This cartridge is identified by its large-diameter rim, measuring nearly 48 mm, and by the blowout disk in the cartridge base surrounding the percussion primer. Both HE and AP projectiles were used. This gun and cartridge were in use during the 1940s but are no longer in service.

Characteristics:

Cartridge weight ..... 520-540 g
Projectile weight ..... 115-136 g
Muzzle velocity ..... 950 m/s

Index No. 22 23x106

Other Designation: 23-mm Madsen.

This cartridge, developed in Denmark in the 1930s for the 23 mm Madsen aircraft gun used in the Fokker D-21 aircraft, is reported to have been used in the 1939 Russo-Finnish war. Cartridges were made in Denmark and in the United Kingdom by Imperial Chemical Industries, Ltd. (Kynoch). The gun and cartridge have been obsolete since the mid-1940s.

Characteristics:

Cartridge weight ..... 341 g
Projectile weight ..... 174 g
Muzzle velocity ..... 720 m/s

Index No. 23 — 23x115

Other Designations: 23-mm NR/NS 23; 23-mm AM-23; Chinese Types 2, 2H, and 2K

This standard Soviet aircraft gun cartridge (also made in Czechoslovakia, Egypt, China, and Romania) is used in three gun systems: NR/NS 23, AM-23, and GSh-23. Both HEI and API loadings have been reported. Although dimensionally similar, cartridges for AM-23 and GSh-23 guns differ in their loading and are not functionally interoperable with NR/NS-23 cartridges. AM-23 and GSh-23 cartridges are identified by a white band around the projectile body.

All 23x115 cartridges have percussion-primed brass cases. They can be identified by the cartridge headstamp.

Characteristics:

Cartridge weight ..... 321-345 g
Projectile weight ..... 174-200 g
Muzzle velocity ..... 690-740 m/s

★Index No. 24 — 23x152B

Other Designations: 23-mm ZU-23; ZSU-23-4; 23-mm VYa aircraft gun.

This cartridge was developed by the Soviet Union for use in the World War II VYa aircraft gun. When this gun was replaced by the 23x115 NR/NS aircraft gun, the excellent performance of the 23x152B VYa cartridge led to its further development as a high-performance cartridge for the ZU-23 and ZSU-23-4 AA gun systems.

While very similar in dimensions, the steel-cased ZU/ZSU cartridges are not functionally interoperable with the brass-case VYa cartridge. The latter, however, has continued in production for use in tank subcaliber guns. Steel-cased ZU/ZSU cartridges are made in Egypt and are also produced in Bulgaria.

Characteristics:

Cartridge weight ..... 437-450 g
Projectile weight ..... 183-192 g
Muzzle velocity ..... 930-1000 m/s

Index No. 25 24x138

Other Designation: 24-mm TkB, K-38.

Introduced by Switzerland in 1938 for the Swiss Tankbuchse (tank gun) Model K-38, this gun was probably withdrawn from service during the 1940s. HE and AT cartridges were made. Ammunition is, however, still reportedly manufactured for subcaliber use.

Characteristics:

Cartridge weight	460 g
Projectile weight	225 g
Muzzle velocity	900 m/s

★Index No. 26 25x137

Other Designations: 25-mm Oerlikon Type KBA; Mauser Model E; US M242 and GAU-12A.

Introduced by Oerlikon in the 1960s, this high-performance cartridge can be recognized by the annular link-positioning groove located 98.5 mm from the base of the steel cartridge case. This groove disappears when the cartridge is fired but leaves an impression on the case. HEI-T, APDS-T, and multipurpose projectiles are available. In addition to Switzerland, 25x137-mm cartridges are produced by Manurhin (France), Raufoss (Norway), and DeKruithoorn (Netherlands).

The cartridge is used in Oerlikon's Model KBA gun. The United States has adopted this cartridge for use in the M242 Bushmaster automatic gun. US cartridge designations are M791 (APDS-T) and M792 (HEI-T). The 25x173-mm is under evaluation for consideration as NATO standard.

Characteristics:

	HE-T	APDS-T
Cartridge weight	502 g	435 g
Projectile weight ...	180 g	105 g
Muzzle velocity	1100 m/s	1463 m/s

Index No. 27 25x165

Other Designation: 25-mm Hotchkiss AA gun.

This cartridge was developed by France during the 1930s for use in a Hotchkiss-designed automatic AA gun. During World War II, Japan produced a naval version of this gun, designated the Type 96 Model 2 AA and AT automatic cannon. Cartridges are similar to French-made ammunition, but French and Japanese cartridges are not interoperable due to minor differences in cartridge-case dimensions. HE, HE-T, HEI (white phosphorus), and AP projectiles are known. The gun and ammunition have been obsolete since the close of World War II.

Characteristics:

Cartridge weight	687 g
Projectile weight	252 g
Muzzle velocity	905 m/s

✱Index No. 28 25x195

Other Designation: 25-mm Hotchkiss AT.

Used in the French-made 25-mm Model 37 Hotchkiss-Puteaux S.A.L. AT gun, this cartridge was in service during the initial stages of World War II but was not produced after the war. Aside from an AT cartridge, a HEAT projectile, which weighs 2 kg and is thus an over-caliber projectile propelled by a blank cartridge, is reported to have been used. A rimless version of this cartridge was also produced for a semiautomatic AT gun.

Characteristics: (AP cartridge)

Cartridge weight ..... 861-875 g
Projectile weight ..... 320 g
Muzzle velocity ..... 900-960 m/s

Index No. 29 — 25x205SR

Other Designation: 25-mm Soviet AA gun, M1940.

This cartridge, which has dimensions very close to those of the Swedish 25-mm Bofors L/64 cartridge that was adopted in 1933, differs in having three rotating bands; the rearmost band is inserted into the cartridge-case mouth, which is then crimped just to the rear of the middle rotating band. Dimensions of the Soviet cartridge case were scaled from a drawing and may vary from those given in table I. The cartridges, which are fed from seven-round Bofors-type clips, have an annular groove in the cartridge base, similar to the Soviet 37x253SR cartridge. HEI-T projectiles with A-23 fuzes, Index УОЭР-132 (UOZR-132), and AP-T projectiles, Index УЗР-132 (UZR-132), are reported; these designations are stenciled on the cartridge case. These three-band projectiles were also used in 25x219 cartridges for a Soviet naval AA gun. The 25x205SR cartridge was used in the Soviet towed AA gun, M1940. The gun and cartridges were obsolete in the Soviet service after the close of World War II but may still be in use in outlying countries under Soviet influence.

Characteristics:

	HEI-T	AP-T
Cartridge weight	672 g	684 g
Projectile weight ...	288 g	295 g
Muzzle velocity	900 m/s	900 m/s

★Index No. 30 25x218

Other Designations: 25-mm Soviet twin-barrel naval AA gun; 25-mm Chinese twin-barrel naval AA gun, Type 61.

This rimless cartridge is fired in the Soviet naval twin AA gun systems, Models 2-M3 and 2-M8. Two types of projectiles have been noted; the older type, with three copper rotating bands, is identical to projectiles for the 25x205SR gun. The rearmost rotating band is inserted into the mouth of the brass cartridge case, which is crimped just to the rear of the middle rotating band.

Newer HEI-T projectiles with MG-25 fuzes have two copper rotating bands; again, the rearmost band is inserted into the mouth of the brass or steel cartridge case. Cartridge cases carry the index УОЗР-85 (UOZR-85) or УОЗР-85М (UOZR-85M) stenciled on the cartridge case. China produces a copy of the latter.

Characteristics:

Cartridge weight ..... 639-644 g
Projectile weight ..... 281-285 g
Muzzle velocity ..... 900 m/s (est)

✱Index No. 31 27x145B

Other Designations: Mauser MK27; 27-mm Mauser MRCA gun.

This cartridge has been developed for the Mauser high-performance revolver-type MK27 aircraft gun intended for the West German-British-Italian "Tornado" aircraft. Like other aircraft gun cartridges developed from the Mauser MK213 cartridge, it is electric primed. Projectiles for this cartridge include AP, APHEI, HEI, and two types of training practice projectiles.

Characteristics:

Cartridge weight	500-530 g
Projectile weight	240-280 g
Muzzle velocity	1050 m/s

Index No. 32 28x188

Other Designations: 28/20S PzB 41; 28/20 squeeze bore.

This cartridge, the smallest of a family of three squeeze-bore AT guns developed by Germany during World War II, was based on a tapered-bore gun designed by Hermann Gerlich. The cartridge was designed for use in a gun with a tapered, rifled bore, decreasing the bore diameter from 28 mm at the origin of the rifling to 20 mm at the muzzle. The purpose of this design was to achieve an extremely high velocity while reducing air resistance by decreasing the projectile's sectional area. The 28-mm projectile has skirts that are folded or squeezed into recesses in the smaller-diameter projectile body as the projectile moves down the barrel. AP projectiles with a tungsten-carbide core and HE projectiles are known to exist. This ammunition was produced from mid-1940 to the close of 1943, when shortages of critical material forced the termination of the program. Excessive bore wear is also reported to have been a factor in the decision to discontinue production. When the program was terminated, some AP projectiles reportedly had cores of uranium as a substitute for tungsten carbide.

Characteristics:

	AP (WC)	HE
Cartridge weight	650 g	630 g
Projectile weight ...	121 g	100 g
Muzzle velocity	1415 m/s	1500 m/s

Index No. 33 28x199

Other Designation: 1.1-inch US Navy heavy machinegun.

This cartridge was developed during the 1930s for a water-cooled, four-barreled AA gun for shipboard use. Although this gun and ammunition saw some use in World War II, they were replaced in general service by the 20x110RB Oerlikon Mark 4-series guns and were obsolete by the close of the war. Despite its US Navy origin, many cartridges were made by the Army's Frankford Arsenal, in addition to naval contractors.

Characteristics:

Cartridge weight	848 g
Projectile weight	416 g
Muzzle velocity	823 m/s

Index No. 33A 30x28B

✱Other Designation: 30-mm Grenade Launcher, AGS-17.

This Soviet cartridge is fired from the tripod- or vehicle-mounted, belt-fed AGS-17 grenade launcher, which is designed for close infantry support. Unlike the US round, the lacquered steel cartridge case is not of the high-low pressure type. The cartridge fires a PDSD-fuzed high-explosive anti-personnel projectile designated VOG-17M.

Characteristics:

Cartridge weight ..... 350 g
Projectile weight ..... 275 g
Muzzle velocity ..... 185 m/s

Index No. 34 30x86B

Other Designation: 30-mm Mauser MK-213.

The 30x86B cartridge was developed in Germany for the Mauser MK-213 revolver-type aircraft gun, which was one of the most advanced gun designs to appear during World War II. In postwar years, this gun and ammunition provided a basis for further developments in several major Western arms-producing countries, notably employed in the British ADEN and French DEFA designs. The original gun was not produced after the close of World War II, except possibly in a few other countries for trial purposes.

The United Kingdom made a similar 30x86B cartridge in the early 1950s for the Type 3M ADEN 30-mm aircraft gun, which was based on the MK-213 gun. UK cartridges can be distinguished from World War II German cartridges by the case material (brass instead of lacquered steel) and the British identification markings in the extraction groove and on the projectile. The US also made brass-cased 30x86B cartridges, designated T158 through T162, for the T121 revolver aircraft gun. US cases, which are similar to UK cases, may be unmarked.

Characteristics (World War II cartridges):

Cartridge weight ..... 500 g
Projectile weight ..... 330 g
Muzzle velocity ..... 530 m/s

Index No. 35 30x91RB

Other Designations: 30-mm MK 108; 30-mm Japanese Type 2.

This cartridge was developed by Rheinmetall-Borsig during early World War II for a 30-mm low-velocity aircraft gun, the MK 108, which operated on the blowback principle. In 1944-1945, Japan used a closely similar cartridge type--but with a slightly larger diameter rim (29-mm) and shorter projectile--in the 30-mm AA gun, Type 2. HEI, HEI-T, and incendiary loadings are reported. Neither the German nor the Japanese gun and ammunition have been used since the close of World War II.

Characteristics:

Cartridge weight ..... 475-487 g
Projectile weight ..... 330 g
Muzzle velocity ..... 500 m/s

Index No. 36 30x97B

Other Designations: 30-mm Type 3CGF; 30-mm DEFA 541.

This cartridge is the result of postwar French exploitation of the World War II German Mauser MK-213 gun and cartridge. It was developed during the 1950s for the French revolver-type aircraft gun, Type 3CGF, which was redesignated the DEFA 541. The cartridge can be identified by its electric-primed brass case with a French-style headstamp that includes the designation "3CGF." The gun and cartridge were soon replaced by the more-powerful 30x113B DEFA 550-series gun and ammunition; the DEFA 541 gun and its ammunition are no longer in service.

During the late 1960s and early 1970s, the United States made similar experimental cartridges with brass or aluminum cartridge cases but with case lengths of 100 mm and 102 mm. The 100-mm cases, which are percussion-primed, may be marked XM193, XM210, or XM211; the 102-mm cases are electric-primed and may be marked FAT 33.

Characteristics:

Cartridge weight	500 g
Projectile weight	296 g
Muzzle velocity	670 m/s

✶Index No. 37 30x113B

Other Designations: 30-mm DEFA Type 551 (553);
30-mm ADEN.

This cartridge designation is shared by two similar and generally (though not completely) interoperable cartridges, one for the French-developed DEFA Type 551 to Type 553 guns, and the other for the UK-developed ADEN gun. Both are revolver-type aircraft guns that are derived from the World War II Mauser MK-213 gun. Like the Mauser gun ammunition, all 30x113B cartridges have electric primers. France developed its version of the 30x113B cartridge by 1957 for the Type 551 DEFA gun and in subsequent years introduced improved Type 552 and 553 guns. Ammunition has been developed along with the guns, but 550-series ammunition can be used in all three guns. Cartridges include air-to-air and air-to-ground types. Air-to-air cartridges have an HEI-T projectile with a self-destruct fuze to reduce the hazard to friendly ground troops. Air-to-ground ammunition has a primer with a flash tube to ensure ignition during a diving attack against ground targets. Air-to-ground explosive projectiles have a fuze without the self-destruct feature. French cartridges can be recognized by the steel cartridge case, the French-style headstamp, and a stenciled case marking indicating the type of cartridge. DEFA ammunition has also been made by Oerlikon and Hispano-Suiza, by West Germany, and by Israel.

Characteristics (DEFA ammunition):

Cartridge weight ..... 440-480 g
Projectile weight ..... 236-275 g
Muzzle velocity ..... 760-818 m/s

UK development of the ADEN gun and cartridge paralleled that of France. The first types, produced in the early 1950s, used a low-velocity 30x86B cartridge in the Type 3M ADEN gun; these cartridges were superseded in the mid-1950s by the current 30x113B cartridge. ADEN ammunition can be recognized by the brass cartridge case with UK-style model designations on projectile and fuze, and by producer, model, and year data stamped in the bottom of the extraction groove of the cartridge case. ADEN cartridge cases are slightly shorter in case length than DEFA cases; the former may be as short as 111 mm. This reduced length poses no problem in functioning in revolver-type guns, since the cartridge case belt indexes the cartridge in the revolver chamber. ADEN cartridges have been produced by Hispano-Suiza and Oerlikon, as well as by Sweden, West Germany, Finland, the Netherlands, and Belgium. The United States has developed a family of aluminum-cased 30x113B cartridges, designated XM 788 (TP), XM 789 (HEDP), and XM 799 (HEI) and intended for the XM 188E1 gun, which will be functionally interoperable with ADEN and DEFA guns.

Characteristics: (ADEN ammunition)

Cartridge weight ..... 440-503 g
Projectile weight ..... 226-270 g
Muzzle velocity ..... 590-800 m/s

Index No. 38 30x114

Other Designation: 30-mm Japanese HO-155

Japan developed the 30x114 cartridge during World War II for the 30-mm aircraft cannon, HO-155. The gun and ammunition have been obsolete since the end of the war.

Characteristics: Not available

Index No. 39 30x123

Other Designation: 30-mm Japanese Type 5.

The 30x123 cartridge was used during World War II in the Japanese naval aircraft gun, Type 5. Cartridge case dimensions were scaled from World War II drawings, and measured dimensions may vary to some degree from those shown in table I. The gun and ammunition have been obsolete since the close of World War II.

Characteristics: Not available

✱Index No. 40 30x155B

Other Designation: 30-mm Soviet NR-30; Chinese Type 1.

Introduced by the USSR in the mid-1950s for the NR-30 aircraft gun, this cartridge is still in service. Cartridge types include a fragmentation-HEI cartridge with a PD fuze, Model A-30 or B-30, and a fragmentation-HE cartridge with a BD fuze Model DBM-30, and a sheet-metal windshield that gives the appearance of an API cartridge. There is no visible indication that the projectile contains HE filler. Cartridge cases are of brass.

The fragmentation-HEI cartridge is also made in Czechoslovakia; this cartridge can be recognized by the characteristic Czechoslovak headstamp marking, which includes a three-letter factory (producer) code, i.e., dtp. HEI-T, HEI, and APHE cartridges are produced in China; HE, HEI, and HE-T rounds are manufactured in Romania.

Characteristics:

Cartridge weight ..... 838-850 g
Projectile weight ..... 392-418 g
Muzzle velocity ..... 780 m/s

Index No. 41 — 30x170

Other Designations: 30-mm Oerlikon KCB (HSS 831 series); 30-mm RARDEN.

Developed at the close of World War II by Hispano-Suiza and still produced by Oerlikon, this cartridge remains one of the world's high-performance automatic gun cartridges. Cartridge types include point-fuzed HEI cartridges, double-fuzed HEI cartridges with a windshield, and API and APDS-T types. This cartridge is used in Oerlikon KCB (HSS 831-series) guns, and in the United Kingdom's RARDEN gun. These cartridges have also been produced by West Germany, France, and Egypt, as well as by the United Kingdom, which has developed a high-performance APDS-T cartridge for the RARDEN gun.

Cartridges for the HSS 831A gun have a brass (or rarely, steel), cartridge case and a wide copper rotating band; HSS 831A cartridges may not chamber fully in the newer HSS 831L gun, which fires steel-cased cartridges having a narrow sintered-iron rotating band.

Characteristics:

Cartridge weight	725-900 g
Projectile weight	300-452 g
Muzzle velocity*	920-1080 m/s

*The RARDEN APDS-T cartridge has an estimated muzzle velocity in excess of 1150 m/s.

★Index No. 42 — 30x173

Other Designations: 30-mm Oerlikon KCA (304 RK); Mauser Model F; US GAU-8A and GAU-9A.

This modern, high-performance, electric-primed cartridge was developed during the 1950s by Oerlikon for the KCA (formerly 304 RK) revolver gun for aircraft.

Cartridge types include HEI, API, and SAPHEI cartridges. A variant of this cartridge was the 30x180, an electric-primed cartridge produced by Oerlikon in 1953 for the RK 302 gun; these cartridges were made for trials but were never mass produced.

In recent years, the United States has produced aluminum-cased cartridges in 30x173 caliber; these have percussion primers when made for the GAU 8A gun and electric primers when made for the GAU 9A gun.

Characteristics:

Cartridge weight ..... 800-910 g
Projectile weight ..... 325-433 g
Muzzle velocity ..... 950-1100 m/s

Index No. 43 30x185B

Other Designations: 30-mm MK 101; MK 103.

This cartridge was introduced in Germany about 1936 as a percussion-primed cartridge for the MK 101 aircraft gun. An electric-primed version of the cartridge was made for the MK 103 gun. The cartridges have similar case dimensions but can be distinguished by the presence of a c/33 percussion primer or a c/23 electric primer. HE, HEI, HEI-T, API, APHEI, and AP-T cartridge types are known to have been produced; the AP-T cartridge had a projectile with a tungsten carbide core and a muzzle velocity of 960 m/s. The guns and cartridges were not used after the close of World War II.

Characteristics:

Cartridge weight ..... 770-960 g
Projectile weight ..... 295-500 g
Muzzle velocity ..... 700-960 m/s

✱Index No. 44 30x210B

Other Designation: 30-mm Type NN-30.

This electric-primed, brass-case cartridge is used in the Soviet naval AA gun, Type NN-30. Cartridges are identified by the stenciled case markings, which include the Cyrillic cartridge designation УФ-83 (UF-83) and gun designation НН-30 (NN-30), and by the typical Soviet cartridge headstamp marking. Types manufactured include HEI with PDSD fuze, HE with BD fuze, APHEI with BD fuze, and a tracer cartridge with PDSD fuze.

A similar and probably identical cartridge is reportedly manufactured by Yugoslavia under the designation M69. The HE projectile has a PD fuze, Model UT M69-SM.

Characteristics:

Cartridge weight ..... 1140 g
Projectile weight ..... 435 g
Muzzle velocity ..... 1000 m/s

Index No. 45 30x210

Other Designations: 30-mm AA gun, M53/59, M53/70.

This cartridge is used in the Czechoslovak twin AA gun, M53/70, which was introduced in the 1950s and is still in use. HE and AP types are reported. Ammunition (HE-T) for this gun is also made for export by Yugoslavia.

Characteristics:

Cartridge weight ..... 1050 g
Projectile weight ..... 420 g (est)
Muzzle velocity ..... 1000 m/s

✱Index No. 45A 34x240

Other Designation: Swiss Flab. Kan. 38
(Model 38 AA Gun)

Used in the little-known Swiss Model 1938 AA gun, this cartridge is known to have been produced until at least 1946. The gun and its ammunition have been replaced in Swiss service by the 35-mm Oerlikon KDB gun in a towed twin-gun version.

Characteristics:

Cartridge weight	1553-1572 g
Projectile weight	680-700 g
Muzzle velocity	890-900 m/s

✱Index No. 46 35x228

Other Designations: 35-mm Oerlikon; 35-mm KDA, KDB, or KDC.

Oerlikon developed this high-performance AA gun cartridge in the early 1960s. Two cartridge case types are known; cases with a link positioning groove below the case shoulder are intended for use in the indexing feed belt of the KDA gun, but can be used in all models. This type of case is in current production. Cases without the belt groove were made for use only in the KDB, KDC, and KDE guns.

Cartridge types include HEI and HEI-T, SAPHEI-T, and APDS-T (WC). HE projectiles have a PDSD fuze, Model KZD-242 or KZD-238 and APHE projectiles have a BDSD fuze, Model BZD 357 or BZD 363. The SAPHEI-T projectile incorporates a BDSD fuze, Model BZD 34Z. The gun and cartridges are widely distributed throughout the free world; Austria, Finland, France, Greece, Iran, Japan, Libya, the Netherlands, Saudi Arabia, and West Germany are reported to have these guns, and several of these countries produce the cartridge under license from Oerlikon.

Characteristics:

	Explosive projectiles	APDS-T
Cartridge weight	1567 g	1460 g
Projectile weight ...	550 g	380 g
Muzzle velocity	1175 m/s	1385 m/s

Index No. 47 37x93R

Other Designations: 37-mm M1916; 37-mm M63 Mod 1.

This cartridge and its gun were adopted by the United States in 1916 for infantry use as an adaptation, with very few changes, of a light-weight, man-portable French field howitzer. Although replaced before World War II for combat use, the M1916 cartridge continued in service for subcaliber training with larger artillery pieces and for firing salutes. US-made cartridge cases can be identified by the gun designation "Model of 1916" or the case designation MK 1A2 or MK 1A2B1 in the headstamp of the brass or steel case. The current model of target practice cartridge is designated Cartridge, TP, M63 Mod 1. This cartridge has a blue projectile with white markings. The black-powder-filled projectile has a BD fuze. This cartridge is used in subcaliber guns M1916, M12, M13, M14, and M15. This cartridge is quite close in dimensions to, and in some instances interchangeable with, other low-power cartridges made since the 1890s by Russia, France, Germany, Italy, and the United Kingdom. Best known of these is the French 37/85 field howitzer cartridge, which is interoperable with the US cartridge and saw wide use in World War I. The French cartridge can be identified by the marking "37-85" and the initials "PdPs" in the headstamp and by the presence of two rotating bands on the projectile (the US projectile has one wide rotating band). A similar cartridge, but with a case length of 102-mm, was used in the Maxim automatic gun (nicknamed the Pom Pom) at the turn of the century, while a 37x120R cartridge made by Winchester was used by the United States in the

Hotchkiss quick-firing naval gun in the 1890s. The French gun and its ammunition is reported in use by Yugoslavia as late as 1941.

Characteristics:

Cartridge weight	730-912 g
Projectile weight	550-730 g
Muzzle velocity	328-390 m/s

Index No. 48 37x112

Other Designations: 37-mm Japanese Type 11; 37-mm Japanese HO-203 aircraft gun.

This cartridge was introduced by Japan in 1922 for the Type 11 "infantry accompanying" gun, a light, man-portable field gun much like the US M1916 infantry howitzer. The Japanese infantry used this gun in their campaigns in the 1930s and during World War II. The same cartridge case with slightly different projectiles and fuzes was used in a Japanese aircraft gun, the HO-203, during World War II. Aircraft gun cartridges carry the mark ホ ≈ o ≈ (Ho-203) stenciled on the projectiles. The guns and cartridges have been obsolete since the close of World War II.

Characteristics:

	Type 11	HO-203
Cartridge weight ...	728-863 g	723 g
Projectile weight ..	460-595 g	436 g
Muzzle velocity	400 m/s (est)	400 m/s (est)

Index No. 49 37x133R

Other Designation: 37-mm Type 94 tank gun.

Japan adopted this cartridge in 1934 for the Type 94 tank gun. It was used during World War II but has not been produced since that time.

Characteristics:

Cartridge weight	803-938 g
Projectile weight	460-595 g
Muzzle velocity	640 m/s

Index No. 50 37x137R

Other Designation: US Navy 1-pdr.

Although the official US terminology for this gun and ammunition is Gun, 1-pounder, the metric designation is used in this guide for the sake of uniformity. This gun, another carry over from the early 1900s, saw limited use in World War II, principally as a saluting gun. A Japanese report states that some ammunition was captured, probably when the Philippine Islands were taken, and was used in a 37-mm Japanese battalion gun.

Cartridge cases will carry the designation "Gun, 1-pdr" and sometimes "Case, MK 2" in the headstamp. Some guns may still be found in use for saluting purposes. Blank cartridges for salutes are shorter in length than the service cartridge.

Characteristics:

Cartridge weight ..... 754 g
Projectile weight ..... 500 g
Muzzle velocity ..... 610 m/s

Index No. 51 37x145

Other Designation: 37-mm Japanese HO-204 aircraft gun.

This cartridge was made and used by Japan during World War II in the HO-204 aircraft gun. Projectiles will bear the stenciled designation 九 ≈ ○ 四 (HO-204). The guns and ammunition were obsolete at the close of the war.

Characteristics:

Cartridge weight	893 g
Projectile weight	436 g
Muzzle velocity	450 m/s (est)

Index No. 52 37x145R

Other Designations: 37-mm aircraft gun M4, M10.

Used in US aircraft guns M4 (AN-M4) and M10 during World War II and early postwar years, this rimmed cartridge case was made both of brass (MK IIIA2 case) and steel (MK IIIA2B1 case). These designations will be found in the cartridge headstamp. The guns and ammunition are no longer in use.

Characteristics:

	HE	AP shot
Cartridge weight	875 g	1020 g
Projectile weight ...	608 g	753 g
Muzzle velocity	610 m/s	556 m/s

Index No. 53 — 37x155

Other Designation: 37-mm Soviet N-37.

This Soviet-developed cartridge is used in the N-37 aircraft gun, which was introduced in the 1950s and is still in use.

HEI (Type OFZ), HEI-T (Type OZT), and AP-T (Type BZT) cartridges are known to have been produced. Soviet-made cartridges have brass cases that carry the designation "H-37" (N-37) and other data Cyrillic letters stenciled on the case wall. The cartridge headstamp is also of the Soviet type. This cartridge is also made by Czechoslovakia, using lacquered steel cartridge bases that carry the designation 37 LK over (for AP-T cartridges) PzSv, together with propellant data. The headstamp will include the factory designator "aym."

Characteristics:

	HEI-T(OZT)	AP-T(BZT)
Cartridge weight	1280 g	1300 g
Projectile weight ...	735 g	754 g
Muzzle velocity	690 m/s	675 m/s

Index No. 54 37x166R

Other Designations: 37-mm Japanese Type 94; Type 98; Type 100.

This cartridge was used in three Japanese-designed guns developed from 1934 to 1940 (the Type 94 AT gun and Types 98 and 100 tank guns). Neither guns nor cartridges continued in use after the World War II.

Characteristics:

Cartridge weight ..... 950-1114 g
Projectile weight ..... 460-624 g
Muzzle velocity ..... 700 m/s

Index No. 55 37x195

Other Designation: 37-mm Type NS-37 aircraft gun.

This cartridge of two types, HEI-T (OZT) and API-T (BZT), was used in the Soviet NS-37 aircraft gun, which saw some use during World War II but was replaced in the postwar period by the N-37 aircraft gun.

Characteristics:

	HEI-T	API-T
Cartridge weight	1680 g	1400 g
Projectile weight	475 g	415 g
Muzzle velocity	720 m/s	720 m/s

Index No. 56 37x202R

Other Designation: 37/40 Italian AT gun.

Reported in use as early as World War I, this gun and cartridge were still employed during World War II but are not known to have been used after that. The designation "37/40" is not a model year indicator; the second element indicates the length of the gun barrel in "calibers." This is multiplied by the bore diameter to give the length of the barrel. A gun of 40 calibers is, by current standards, a relatively short-barreled gun. HE and APHE projectiles are reported. Case dimensions were scaled from a drawing, and actual case measurements may vary from those given in table I.

Characteristics:

Cartridge weight ..... 1300 g
Projectile weight ..... 677-698 g
Muzzle velocity ..... Unknown

Index No. 57 37x223SR

Other Designations: 37-mm M1A2; ANM9.

The United States developed this cartridge before World War II for use in the M1A2 automatic AA gun, which was used during World War II and the Korean War. The same cartridge was used, briefly, in the ANM9 aircraft gun during World War II. Both brass (M17) and steel (M17B1) cases were made; they can be recognized by the model designation in the cartridge headstamp. HE and AP projectiles were used. Although obsolete in the US service, the M1A2 gun and its ammunition were used in other countries, particularly France, during postwar years and may still be found in service.

Characteristics:

	HEI-T	APC-T
Cartridge weight	1210 g	1440 g
Projectile weight ...	560 g	680 g
Muzzle velocity	792 m/s	792 m/s

Index No. 58 37x223R

Other Designations: 37-mm AT gun M3; 37-mm tank gun M5, M6.

Designed before World War II for the single-shot 37-mm AT gun M3 (M3A1) and used in tank guns of the M5 and M6 series on prewar light tanks, this cartridge resembles the preceding 37x222SR cartridge; the two types, however, are not interchangeable. Aside from the cartridge rim, this case can be identified by the M16 cartridge-case designation that appears in the headstamp. The gun and ammunition were obsolete in the US service before the end of World War II, but some may be found in use elsewhere.

Characteristics:

Cartridge weight ..... 1400-1500 g
Projectile weight ..... 730-870 g
Muzzle velocity ..... 793-823 m/s

Index No. 59 37x232

Other Designation: 37/54 Italian AA gun.

This cartridge was designed for use in the tray-loaded, semiautomatic, Model 37/54 AA gun. With a propellant weight nearly double that of the older 37/40 cartridge (and fired in a longer-barreled gun), this cartridge clearly develops a higher muzzle velocity and a longer range. The gun was developed before World War II but has not been in use since the close of the war.

Case dimensions were scaled from a drawing, and actual case measurements may vary somewhat from those given in table I.

Characteristics:

Cartridge weight ..... 1590 g
Projectile weight ..... 800 g
Muzzle velocity ..... Undetermined

Index No. 60 — 37x250R

Other Designation: 3.7-cm PAK 36.

This cartridge was developed in Germany for the PAK 36, a two-wheeled, towed AT gun that closely resembles its US counterpart. It was also used in a tank gun designated the 3.7-cm KWK and in a Swedish 37-mm AT gun, m/39.

A very similar and probably interchangeable cartridge was produced in Japan before World War II for the Type 97 (1937) AT gun. Although not now in service with any major country, this gun and ammunition may be in use elsewhere.

Characteristics:

	German data	Japanese data
Cartridge weight	1350 g	1030-1165 g
Projectile weight ...	695 g	460-595 g
Muzzle velocity	760 m/s	760 m/s (est)

Index No. 61 37x251R

Other Designation: 37-mm Japanese Type 1.

Although this cartridge is very similar to the 37x250R cartridge in dimensions (and probably in performance), it is not interchangeable because of differences in case diameter and contour. This cartridge was developed for the Japanese Type 1 (1941) tank and AT guns. The guns and ammunition have not been used since the end of World War II.

Characteristics:

Cartridge weight ..... 1375-1410 g (est)
Projectile weight ..... 595-624 g
Muzzle velocity ..... 760 m/s

Index No. 62 37x253R

Other Designations: 37-mm Soviet AA gun, M1939, 37-mm Chinese Type 55 (single barrel); Type 65, Type 74, and Type P793 (twin barrel).

This Soviet cartridge was developed for the M1939 AA gun; its brass cartridge case can be identified by the annular groove in the base for a Bofors-type clip and by the characteristic Soviet headstamp marking. HEI-T and API-T cartridges are known; the former have УОР-167 (UOR-167) stenciled on the case wall together with lot and propellant data, and the latter have УБР-167 (UBR-167). The gun and cartridges are now obsolescent in the USSR, but HE, HE-T, and AP-T cartridges have been produced in China as Type 55, and HEI-T cartridges are produced in Egypt, Pakistan, and Yugoslavia.

Characteristics:

	HEI-T	API-T
Cartridge weight	1440 g	1500 g
Projectile weight	710 g	770 g
Muzzle velocity	880 m/s	906 m/s

Index No. 63 37x258R

Other Designations: 37-mm m/34 (m/38); 3.7-cm Wz 36.

This cartridge was designed by Bofors for single-shot artillery-type AT guns and thus does not have the deep annular groove that is found on the base of cartridge cases for Bofors-type automatic guns. The cartridge was used in several Swedish AT gun models: m/34, m/38, m/39-43, and m/40-43, as well as in the m/38 tank gun. The same cartridge was used by Poland in the Wz36 (Model 36) AT gun, and cartridges in this caliber were made by Germany early in World War II. The gun and cartridge were also adopted by Denmark under the designation M37. These guns and this ammunition were not used after World War II because increased armor protection made this caliber AT gun obsolete.

Characteristics:

Cartridge weight	1350-1390 g
Projectile weight	700-740 g
Muzzle velocity	785-800 m/s

Index No. 64 37x264B

Other Designations: 3.7-cm FLAK 18 and 36; 3.7-cm M38, M39 AT gun.

Developed in the 1930s by Germany for use in the FLAK 18 and 36 AA guns and the M38 and M39 AT guns, this cartridge was also used in an aircraft gun during World War II. Like many other cartridges of the period, it has not been used since the close of World War II.

Characteristics:

Cartridge weight ..... 1580 g
Projectile weight ..... 700 g
Muzzle velocity ..... over 900 m/s

Index No. 65 37x267R

Other Designation: 3.7-cm M34 AT gun.

This cartridge was used in the prewar Czechoslovak M34 antitank gun, which is reported to have been used by Yugoslavia in 1941. Germany made ammunition for this gun during World War II, but no postwar use is known.

Characteristics: Not available

Index No. 66 37x278R

Other Designation: 37-mm Hotchkiss Mle 1925.

This cartridge is reported to have been used in a French Hotchkiss gun, Model 1925, and in subsequent Models 1929, 1930, and 1934, as well as in a Casement M1934 gun. Projectiles include an APC-T (Mle 1934) and HE (Mle 1938). No further information is available on the guns that used it.

Characteristics: Not available

Index No. 67 37x303R

Other Designation: 37-mm "Davy Crockett" spotter.

The 37x303R cartridge was developed in the early 1960s as a spotter cartridge for the US "Davy Crockett" M29 heavy weapon system. It fires a long fin-stabilized spotter projectile through a smoothbore 37-mm gun mounted below the muzzle of the primary weapon. The cartridge case contains a high-low pressure system to ensure reliable ignition while holding chamber pressure to a proper working level. The projectiles has an electric impact fuze that, on impact, produces a flash and a column of smoke visible at a range of 4000 meters. (Caution! Spotter projectiles contain a small PETN burster charge!) Two versions of this cartridge exist: The M415E7 for shorter ranges and the M446E2 for longer ranges. Cartridge cases can be distinguished by the cartridge model designation, which is stamped on the cartridge base. The M415E7 case also has an identifying annular groove in the case base. Both cartridges have spanner wrench holes in the closing plug in the cartridge base. The "Davy Crockett" system is no longer in service.

Characteristics:

	M415E7	M446E2
Cartridge weight	2200 g	2070 g
Projectile weight ...	1030 g	1030 g
Muzzle velocity	167 m/s	247 m/s

Index No. 68 37x320R

Other Designations: 37-mm Infantry Gun, M1937 (Denmark), 37-mm Bofors M1939 AA gun.

This cartridge is known to have been produced by Bofors in Sweden and by Denmark in 1939 and 1940, but specific production dates cannot be ascertained. Both HE-T and AP-T cartridges are reported.

Characteristics:

	HE-T	AP-T
Cartridge weight	1500 g	1655 g (est)
Projectile weight	740 g	780 g (est)
Muzzle velocity	850 m/s	870 g (est)

Index No. 69 37x380R

Other Designation: 3.7-cm C-30.

Developed in Germany before World War II, this high-performance cartridge was used in the naval AA gun, Model C-30. This gun and its HE-T cartridge were used during World War II, but no postwar use is reported.

Characteristics:

Cartridge weight ..... 1814-2040 g
Projectile weight ..... Not available
Muzzle velocity ..... Not available

Index No. 70 40x46R

Other Designation: 40-mm Grenade Launcher, M79.

This cartridge is designed to be fired from the single-shot, shoulder-held grenade launcher M79 or the M203 launcher attached to the M16 rifle. It was also fired in the tripod-mounted, automatic-loading grenade launcher, XM174. A shorter cartridge case, 30.2 mm long, is used with pyrotechnic cartridges. The case may carry the stenciled designation XM195 or M195.

Characteristics:

Cartridge weight ..... 228 g
Projectile weight ..... 175 g
Muzzle velocity ..... 76 m/s

Index No. 71 40x53SR

Other Designation: 40-mm Grenade Launcher M75.

This cartridge is a higher-velocity version of the 40x46R cartridge, designed to be fired from M75, XM175, and M129 tripod-mounted, automatic-loading grenade launchers and from the MK 19 Mod 1 US Navy machinegun. These high-velocity cartridges are not to be used in launchers designed for the low-velocity 20x46R cartridge. Cases may be marked with the case model XM 169 (M169), either stenciled on the case wall or as part of the cartridge headstamp.

Characteristics:

Cartridge weight ..... 340 g
Projectile weight ..... 175 g
Muzzle velocity ..... 240 m/s

Index No. 72 40x143R

Other Designation: 40-mm AA gun, Model 40/39.

This cartridge was used in the Italian 40-mm AA gun, Model 40/39, which dates from the World War I period. The designation "39" indicates a barrel length of 39 calibers, or 1.56 meters. Data on the ammunition are incomplete; the case length has been scaled from a drawing in TM 9-1985-6; actual measurements will probably differ from those given in table I.

Characteristics:

Cartridge weight ..... 1450 g
Projectile weight ..... Not available
Muzzle velocity ..... Not available

Index No. 73 40x158R

Other Designation: 40-mm Vickers-Armstrong.

Developed by Vickers-Armstrong in the post-World War I period, this gun saw limited use in World War II, having been replaced by the Bofors 40-mm automatic gun. Japan, however, made and used some cartridges for this gun during World War II. The gun and ammuniton were obsolete at the war's end.

Characteristics:

Cartridge weight ..... 1325 g
Projectile weight ..... 1000 g
Muzzle velocity ..... 853 m/s

Index No. 74 40x305R

Other Designation: 2-pdr AT gun.

Developed by the United Kingdom before World War II, this cartridge was used in single-shot, quick-firing, 2-pounder AT guns, Marks 9 (9A) and 10 (10A and 10B). HE-T and AP-T cartridges are reported. The guns and ammunition saw some use in World War II but are now obsolete.

Characteristics:

	HE-T	AP-T
Cartridge weight	1900 g	2025 g
Projectile weight ...	880 g	1075 g
Muzzle velocity	792 m/s	850 m/s

Index No. 75 40x311R

Other Designations: 40-mm Bofors M/40 AA gun; 40-mm Bofors L-60; 40-mm Bofors MK I, MK II.

Developed by Bofors during the 1930s, this was probably the most widely used AA gun in World War II, employed by the United States, the United Kingdom, Germany, and Italy (and also in the Swedish inventory). Both brass and steel cartridge cases were used. The cartridge is still produced by such major ammunition producers as Bombrini Parodi-Delfino in Italy, Fabrique Nationale in Belgium, and Diehl in West Germany, and is also manufactured in Yugoslavia, France, the Netherlands, Sweden, Egypt, and Pakistan.

US-made cartridge cases of army design carry the case designation M25 (brass) or M25B1 (steel). Cases of navy design will have the MK 2 or MK 2 Mod 1 brass case or MK 3 steel case, which differs in having a primer seat threaded for the British primer.

The United States made HE-T and AP-T cartridges in this caliber.

Characteristics:

Cartridge weight	2030-2150 g
Projectile weight	900-940 g
Muzzle velocity	823-875 m/s

✱Index No. 76 40x365R

Other Designation: 40-mm Bofors L-70.

Developed by Bofors in Sweden during the 1950s and standardized in 1954, this cartridge provides improved performance over that of the cartridge for the L-60 gun. Bofors has introduced advanced design features into this ammunition, including controlled-fragmentation projectiles and proximity fuzes. Ammunition is produced in many other countries (Luchaire in France, Diehl in West Germany, Oerlikon in Switzerland, Bombrini Parodi-Delfino in Italy, Fabrique Nationale in Belgium, DeKruithoorn in the Netherlands, Pyrkal in Greece, Valmet in Finland, and in the United Kingdom and Yugoslavia).

Characteristics:

	HE-T	APDS-T
Cartridge weight	2420-2510 g	2250 g
Projectile weight ...	880-960 g	705 g
Muzzle velocity	1005-1025 m/s	1200 m/s

Index No. 77 — 30x165

Other Designation: None known.

This cartridge was introduced by the USSR in the mid-1970s, probably for the 30-mm automatic cannon mounted as the main gun on the BMP-2 infantry fighting vehicle. Cartridge types include a fragmentation HEI cartridge with a PDSD fuze, Model A-670M. There is no visible indication of the HE filler content in the projectile. Cartridge cases are made of zinc coated steel; primers may be either percussion or electric. Headstamps follow standard Soviet marking practice for small caliber ammunition.

Characteristics:

Cartridge weight	850 g
Projectile weight	390.5 g
Muzzle velocity	950 m/s (est)

Index No. 78 25x180

Other Designation: Oerlikon Type KBB.

Developed and introduced by Oerlikon in the early 1980s, this cartridge is an elongated version of the 25x137-mm used with the Oerlikon Type KBA automatic cannon, Mauser Model E, US M242 Bushmaster and GAU-12A guns. Designed for use with the KBB automatic cannon, this cartridge has greater muzzle velocity, range, and penetration, than the 25x137-mm used in the KBA.

Six types are currently produced: HEI, APDS-T, AMDS (antimissile discarding sabot) and three training practice types. This cartridge, at this writing, is produced only by Oerlikon.

Characteristics:

	HEI	APDS-T
Cartridge weight	625 g	550 g
Projectile weight	230 g	150 g
Muzzle velocity	1160 m/s	1460 m/s

(Reverse Blank)

SECTION IV

MARKING PRACTICES BY COUNTRY

A. GENERAL

1. Scope

This section summarizes cartridge marking practices for selected ammunition-producing countries.

2. Organization

Countries are arranged in alphabetical order, with the addition of World War II-Germany and Japan as a separate element, following West Germany in sequence.

B. COUNTRY MARKING PRACTICES

3. China

a. General. China has manufactured copies of Soviet cartridges in several calibers, of which the 37x253R cartridge is typical. This cartridge is used in the Chinese Type 55 AA gun, a copy of the Soviet M1939 gun.

b. Cartridge Marking Practice. The markings that appear on the Chinese-made cartridge of this caliber are as follows:

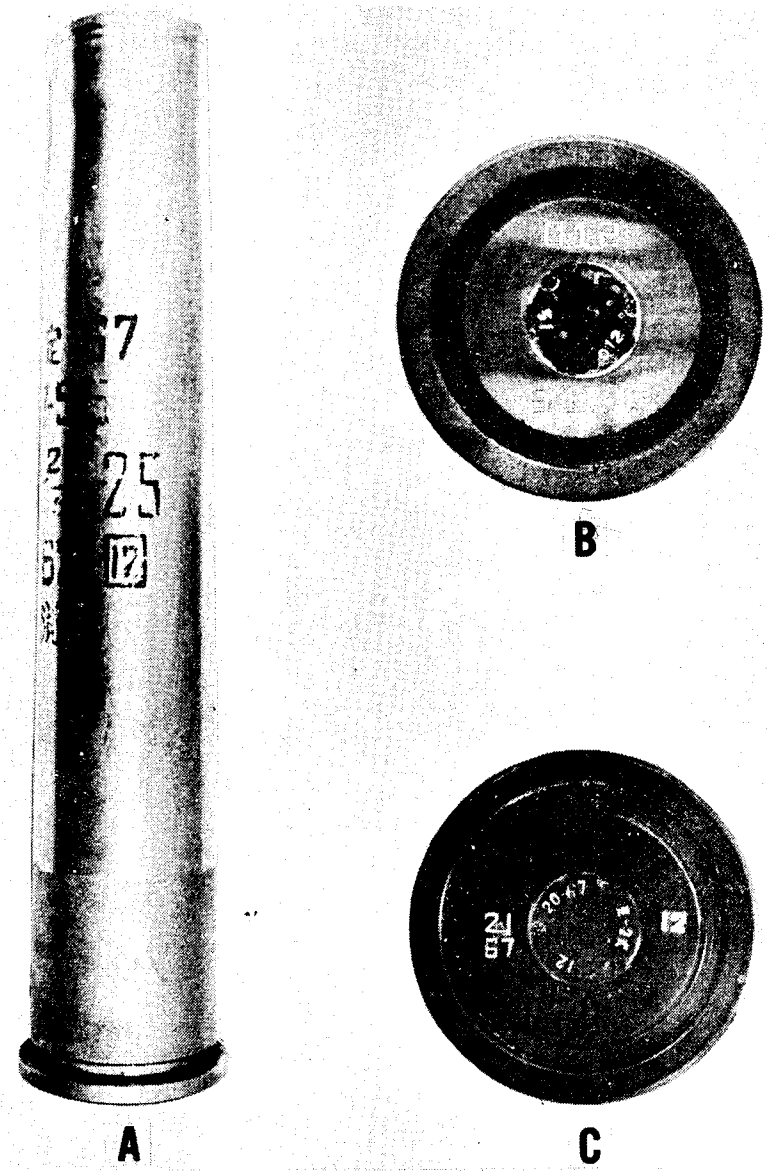
(1) The fuze, if present, and projectile carry stamped Western numerals that provide factory code, lot number, and year of manufacture. A Chinese character may also be present.

(2) The cartridge case is stenciled in four lines with caliber, gun model, and propellant

and cartridge lot data, using block-style Western numerals. One or more Chinese markings may also appear.

(3) The headstamp is marked in block-style Western numerals that include a factory number, lot, and year of manufacture. The percussion primer may carry a Chinese character, together with factory, lot, and year data.

(4) Figure 7, view A, shows a 37x253R cartridge case of 1962 manufacture that includes the number 167 (which is the Soviet index number for cartridges of this caliber), the designation 37-55 (which represents the caliber), and the Chinese designation, Type 55, for the gun that uses this cartridge. Cartridges of recent manufacture have dropped the index number 167 from the marking. Views B and C show two styles of headstamp markings. Both indicate manufacture by a plant with the code number 12, but in different years--1951 and 1967. The block numerals are characteristic of Chinese markings.



Neg. 526260
Figure 7. Chinese Cartridge Markings

4. Czechoslovakia

a. General. Postwar Czechoslovak cartridge manufacturing procedures have followed Soviet practice in calibers and functional types, with the exception of cartridges for the twin 30-mm AA gun, Model 53/70. Czechoslovak ammunition can be recognized by the characteristic factory code composed of three lowercase letters, which resembles, but differs slightly from, the letter code used by Germany during World War II. Cartridge cases (and other items as well) may carry a crossed-sword mark (see view C in fig 8).

b. Cartridge Markings.

(1) Markings on Czechoslovak Soviet-caliber ammunition follow the Soviet pattern but differ in that designations and terms are in Czech.

(2) Fuzes are stamped with a Czechoslovak model designation, a factory code, and lot and year data.

(3) Projectiles carry a stamped factory code and lot and year data. Stenciled markings are also found occasionally.

(4) The 23x115 and 30x115B aircraft gun cartridges, like their Soviet counterparts, have no stenciled marking on the cartridge case. The 37x115 cartridge cases, which differ from Soviet cases in that they are made of lacquered steel rather than brass, carry a stenciled marking that includes caliber, projectile type, propellant data, factory code, lot number, and year (view B, fig 7).

(5) Headstamp markings vary in layout but include the characteristic three-letter factory code. View A in figure 8 shows a headstamp from a 23x115 cartridge; view C shows a 37x155 headstamp.

The letters OTK in the latter headstamp are the initials of a government production directorate that can be equated roughly to "Office of Technical Control."

Neg. 526263
Figure 8. Czechoslovak Cartridge Markings

5. Egypt

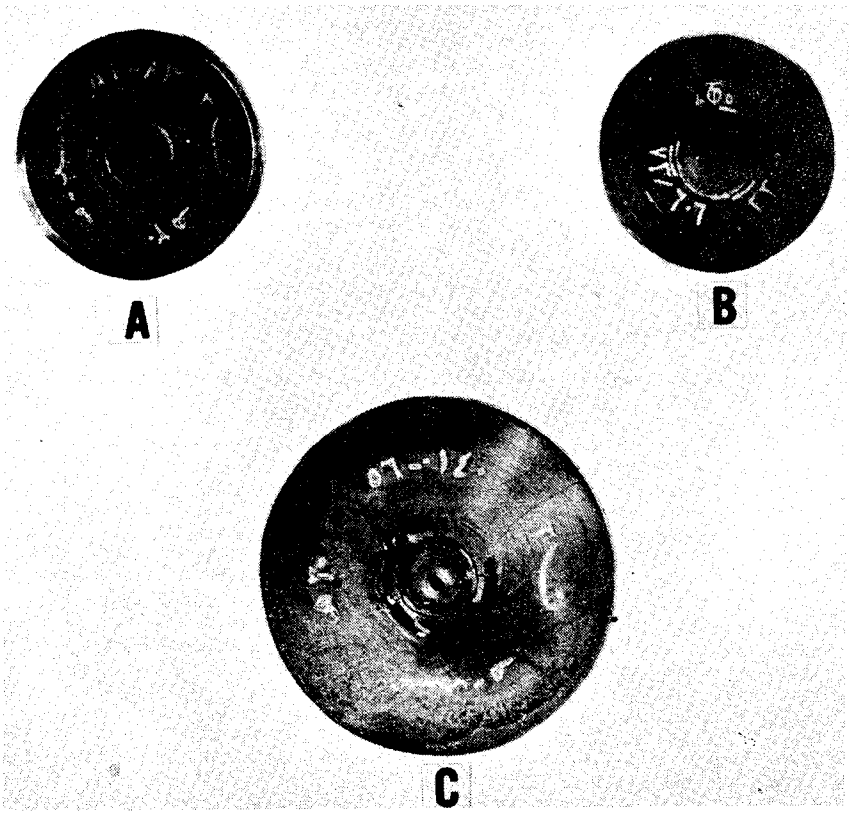
a. General. In recent years, Egypt has produced steel-cased 23x152B cartridges of Soviet design and Hispano-Suiza cartridges in calibers of 20x110 and 30x170. In appearance and construction, these cartridges are similar to their Soviet and Swiss counterparts. They have no identifying markings other than the cartridge headstamp.

b. Cartridge Headstamp Markings.

(1) The headstamp markings, which are in Arabic, include caliber, manufacture, and year of production. A description of the Arabic numbering system and a glossary of ammunition terms are given in section IV, paragraph 10 of Volume 1. The Arabic numerals and their Western Equivalents appear below:

١	1
٢ or ٢	2
٣	3
٤	4
٥	5
٦	6
٧	7
٨	8
٩	9
٠	0

(2) View A in figure 9 shows the headstamp marking on a 20x110 Hispano-Suiza-type TP cartridge, view B on a Soviet-type steel-cased 23x152B cartridge for ZU-23 (ZSU-23-4) guns, and view C the marking on a 30x170 Hispano-Suiza type HE-T cartridge.



Neg. 526262
Figure 9. Egyptian Cartridge Headstamp Markings

6. France

a. General. Projectiles in calibers of 20 mm and above are color-coded to provide a visual indication of functional type and explosive

loading; they also carry stenciled markings that identify the projectile filler and indicate presence of a tracer element. Cartridge cases may carry stenciled markings (giving caliber and gun data) and propellant lot data. Stamped headstamp markings include as a minimum the manufacturer, lot number, and year and may also include caliber and gun designation. Abbreviations for cartridge and component suppliers are given in section IV, paragraph 14b, of volume 1. Table II provides some abbreviations, with the corresponding French terms and US equivalents, found in French cartridge nomenclature in the 20- to 40-mm range.

b. Color coding. French color coding generally follows the NATO color coding system for calibers under 40 mm, but usage varies slightly for ammunition in calibers of 40 mm and above. The following table summarizes current French ammunition color coding practice.

Table II. French Color Coding Practices

Functional type	Projectile body color	Letters and markings color	Color band(s)
	Ammunition below 40 mm		
HEI	Yellow	Black or red	Red
HEI-T	Yellow	Black or red	Red(par.6C)
AP-T	Black	White	---(par.6C)
APDS-T	Black	White	---(par.6C)
Ammunition 40 mm and above (all calibers and types)			
HE	Olive green	Yellow	---
HEI	Olive green	Red	Red
APHE	Olive green	Yellow	Black
AP	Black	White	---
API	Black	Red	Red
Incendiary	Gray	Red	Red

Table II. French Color Coding Practices (Continued)

Functional type	Projectile body color	Letters and markings color	Color band(s)
Smoke	Gray	Yellow	Yellow
Smoke (WP)	Gray	Yellow	Red
Illuminating	Gray	White	White
Chemical Agent (casualty)	Gray	Green	Green
Tear gas	Gray	Violet	Violet
Practice*	Blue	Yellow	None

*Projectile contains an active element of some type.

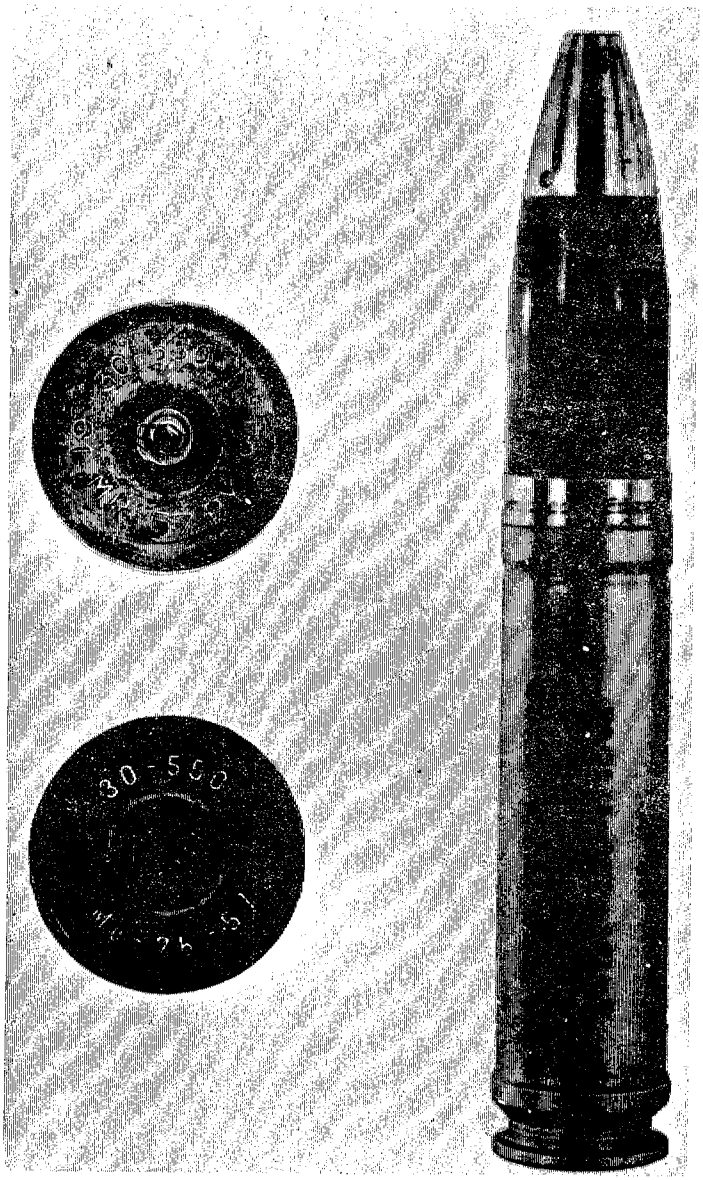
c. Other Markings.

(1) Presence of a tracer element is indicated by three T's, placed 120° apart, in the color prescribed for other projectile markings.

(2) Projectiles that contain an explosive or other hazardous component carry an identifying symbol consisting of a circle that contains one or more letters. Except as noted for white phosphorus, the circle and letters are in the color prescribed for other projectile markings. When an inert phlegmatizer is added to an explosive to reduce sensitivity to shock, the basic explosive symbol will be followed by the letter F. Mixtures of explosives are indicated by a combination of symbols, i.e., HAL for RDS/aluminum mixture. Significance of the letter symbols in current use is shown below:

A.... Plastic explosives with RDX base (Comp C)
B.... Plastic explosives with PETN base
C.... Picric acid/trinitrocresol (Cresylite)
DD... Picric acid/dinitrophenol
DN... Dinitronaphthalene
H.... RDX (Hexogene)
HAL.. RDX/aluminum
HC... Hexachlorethane (smoke)
HT... Composition B
M.... Picric acid (Melinite)
MN... Mononitronaphthalene
MP... Picric acid/paraffin wax
N.... Ammonium nitrate
NAL.. Ammonium nitrate/aluminum
NP... PETN
NX... Ammonium nitrate/xylene
O.... Various chlorate-based explosives
PCH.. Ammonium perchlorate/paraffin wax
PH... White phosphorus (Note: Red letters in red circle).
PN... Black powder
SC... Schneiderite (Aluminum nitrate/ dinitronaphthalene)
T.... TNT (Tolite)
TA... Trinitroanisol
TPL.. Trinitrophenetol
TY... Tetryl

d. Cartridge Markings. Figure 10 shows two cartridge headstamps and a cartridge case marking from 30x113B DEFA aircraft gun cartridges. Table III provides abbreviations and terms used on French cartridges.



Neg. 526201
Figure 10. French Cartridge Markings

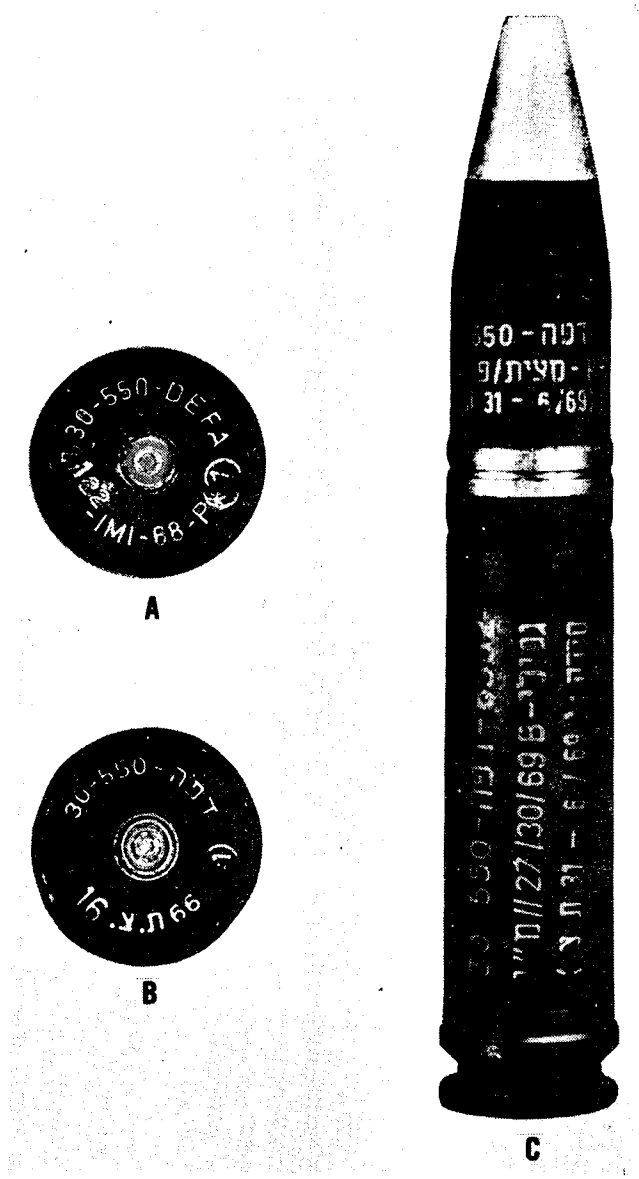
Table III. Abbreviations and Terms on French 20- to 40-mm Cartridges

Abbreviation	French	US equivalent
Fu	Fusée	Fuze
F.U.A.D.(FUA)	Fusée	Fuze, PDSD
--	Noyau	Core; penetrator
O.	Obus	Projectile (shell)
O.A.P.E.I.	Obus antipersonnel, explosif, incendiaire	HEI (Apers) projectile
O.E.	Obus explosif	HE projectile
O.E.I.	Obus explosif incendiaire	HEI projectile
O.E.I.T.	Obus explosif incendiaire, traceur	HEI-T projectile
O.M.E.I.	Obus mine explosif, incendiaire	HEI (mine) projectile
O.I.	Obus incendiaire	Incendiary (I) projectile
O.P.	Obus perforant	AP projectile
O.P.I.	Obus perforant, incendiaire	API projectile
O.P.T.	Obus perforant, traceur	AP-T projectile
O.P.I.T.	Obus perforant, incendiaire, traceur	API-T projectile
O.P.T.S.O.C.	Obus perforant, sous-calibre	APDS-T projectile
O.X.	Obus exercice	Practice (P) projectile
O.X.L.	Obus exercice, lesté	Practice (P) projectile inert-loaded
O.X.T.	Obus exercice, traceur	Practice tracer (PT) projectile

7. Israel

a. General. Israeli-made cartridges can be identified by the Hebrew letters that appear in the headstamp and on the projectile and cartridge case, or by the manufacturer's initials IMI (Israeli Military Industries) if made for export. Markings include manufacture, lot, and year data.

b. Cartridge-Case Markings. Figure 11 shows headstamp and case body markings on Israeli-made 30x113B cartridges for the DEFA 500-series aircraft guns. The headstamp in figure 11, view A is from a cartridge made for export; the marks in views B and C are from cartridges made for internal use. The Hebrew letters to the right of "30-550" read "DEFA."



Neg. 526261
Figure 11. Israeli Cartridge Markings

8. Spain

a. General. Except when otherwise specified, spanish cartridges in calibers of 20 mm and above are identified by a combination of stamped and stenciled markings and color code that identify the cartridge as to caliber and model; guns in which used; functional type; filler; and manufacturer, lot, and year.

b. Color Identification. Spain is considering the adoption of NATO standard color coding in calibers of 20 mm and above. The color coding practice in current use is somewhat different. Normally, only the projectile body, less fuze and rotating band, will be color coded. The basic projectile body color indicates the functional type. One or more color bands, if present, indicate additional functional characteristics. Current Spanish color coding practice, including the color of stenciled markings, is shown in the table IV. Exceptions to this marking practice are noted in subparagraph d below.

Table IV. Spanish Color Coding Practices

Functional type	Projectile color	Letters and markings color
High explosive	Oliver green	Yellow
Burning-type	Medium gray-brown	White
Armor-piercing	Black	Yellow
Incendiary	Medium red	Black
Smoke	Light green	Yellow
Illuminating	White	Black
Practice (may contain a spotting charge)	Medium blue	White
Inert for instruction	Orange	---

Table IV. Spanish Color Coding Practices (Continued)

Functional Type	Projectile Color	Letters and Markings Color
Chemical Contents identified by color bands, as follows:	Medium gray	Yellow
Nonpersistent harassing agent:	One red band	
Persistent harassing agent:	Two red bands	
Nonpersistent toxic agent:	One green band	
Persistent toxic agent:	Two green bands	
Toxic nerve agent:	Three green bands	

c. Stenciled Markings. Stenciled markings on the projectile and cartridge case provide further information on the ammunition. Projectile markings will be in the previously indicated colors; black paint will be used for stenciled markings on brass cartridge cases and white paint for steel cases.

(1) Markings on the projectile body include weight zone squares, projectile functional type, projectile filler composition (within a square), filler lot data, and a two-digit year marking. If a tracer is present, the letter T will appear. Letter codes for fucntional type and filler compositions are shown in table V and VI.

Table V. Functional Type Letter Codes

Letter code	Spanish term	US equivalent
R.	Rompedor	Fragmentation (HE)
Fu.	Fumigeno	Smoke
Il.	Illuminante	Illuminating
E.	Ejercicio	Practice (followed by abbreviation for the functional type simulated)
Ins.	Instruccion	Training (instruction)
Inc.	Incendario	Incendiary
C.H.	Cargo Hueca	HEAT
N.D.	Nucleo Duro	Hard core (AP)
Q.	Quimico	Chemical

Table VI. Projectile Filler Letter Codes

A.T.	Amatol
H.T.	Composition B (Hexolite)
N.A.	Ammonium nitrate
P.	White phosphorus
P.A.	Ammonium picrate
P.N.	Black powder
T.	TNT
T.N.F.	Picric acid
T.T.	TNT + aluminum (Tritonal)

(2) Stenciled markings on the cartridge case show the gun(s) in which used; muzzle velocity, explosive charge weight, propellant lot data, and a two-digit year data. If a decoppering agent is present, the letters DCO will be added.

d. Stamped Markings. Marks are stamped into the metal of the fuze, projectile body, and cartridge case to provide permanent identification data. Stamped markings are applied as follows:

(1) On the fuze: Model, lot number, manufacturer, and two-digit year date.

(2) On projectile ogive: Composition of filler and punched weight zone marks.

(3) On projectile body: Functional type code, caliber, model, lot data, and two-digit year marking.

(4) On cartridge case base: Caliber, model, lot data, and two-digit year date.

e. Nonstandard Cartridge Markings. Several service cartridges and their practice counterparts in the 20- to 40-mm range, which are of Swiss or Swedish origin, carry markings that do not conform to the procedures outlined above. These variant types are described in table VII.

Table VII. Nonstandard Spanish Cartridge Markings

Cartridge	Spanish designation	Other designation	Projectile color code	Stenciled markings on projectile
20x128-mm HEI	Rompedor Incendario	MSB/K	Unpainted ogive; brown body; red & yellow bands	PAE. INCD. Lot # Year Mfr.
20x128-mm	Perorate Alto Esplosivo Incendario	PSBH/B	Blue ogive; brown body; yellow band	PPAE. INCD. Lot # Year Mfr.
20x128 P-T	Ejercicio Trazador	SUL	Black ogive; white bank; brown body	PT. INS. Lot # Year Mfr.
35x228 HEI	Rompedor Incendario	MSB/K	Yellow ogive; brown & red bands	PAE. INCD. Lot # Year Mfr.
35x228 P-T	Ejercicio Trazador	SUL	Black ogive; white band; brown body	PT. INS. Lot # Year Mfr.
40x365 R HE-T	Rompedor Trazador		Yellow ogive; brown body; white band	A.A. 40-mm L/70 LOTE PA. Lot # Year CON TRAZADOR

9. Sweden

a. General.

(1) Swedish service ammunition in calibers of 20 mm or above can be identified as to functional type by a combination of projectile body color and color bands. Basic projectile body colors are as follows:

Projectile type	Projectile body color
AP, APHE	Black
SAP	Red
HE	Yellow (on projectiles in calibers below 60-mm only)

(2) Canister, HE, smoke, incendiary, illuminating projectiles and hand grenades may be painted gray, be unpainted, or have a special surface treatment. The functional type will be indicated by color bands placed around the center of the projectile. Significance of color bands is as follows:

Color band	Projectile type	Note
Yellow	HE	Not used when basic projectile color is yellow.
Orange	Incendiary	
Light gray	Smoke	
Black	AP	Secondary capability

Color bands are approximately one-tenth the projectile diameter (but not less than 10 mm) in width. When more than one ring is present, they will be spaced approximately a ring's width apart.

(3) Tracer ammunition may be indicated by year model designation or a color band, as follows:

(a) When the tracer and projectile have different year model designations, the last two digits of the tracer year model will be stenciled on the projectile ogive, in the tracer color. This may also be done, optionally, when tracer and projectile have the same year model designation. Height of figures will be one-fifth of the projectile caliber, but not over 5 mm.

(b) Alternatively, when the tracer and projectile have the same year model designation, a color band in the tracer color may be stenciled on the projectile ogive. Width of the

ring will be one-tenth the projectile caliber (but not over 5 mm).

(c) A specific tracer marking is not required when all of the following conditions are met:

- When the basic projectile color is yellow.
- When tracer and projectile year model designations are the same.
- When the projectile model is manufactured only with a tracer.
- When the tracer color is normal for that projectile model. This provision applies to many HE-T projectiles in the 20- to 257-mm range.

(d) Practice ammunition that contains an active filler (explosive or incendiary) will have either a blue ring at least 1 cm in diameter or a blue painted projectile. A completely inert-loaded practice projectile will have either a brown ring, three times the width of other color rings for that caliber, or be painted brown in its entirety.

(e) A letter code indicating type of projectile filler is placed next to the corresponding color band and in the same color. If no color band is present, the letter or letters will be in either black or white. Letter height will be one-fifth the projectile caliber, and at least 1 cm high when on the projectile body; letters will be at least 20 mm high when placed on the color band. The following letter codes are used:

A ..... Probably a TNT-ammonium nitrate mixture (Trotan)
E ..... RDX/TNT mixture (Hexotol)
F ..... White phosphorus
H ..... RDX (Hexogen)
K ..... Black powder
N ..... Trinitroanisol (Nitrolit)
R ..... Smoke acid
T ..... TNT (Trotyl)
Z ..... RDX/TNT/Aluminum mixture (Hexotonal)
GRKT .. Shrapnel
LYS ... Illuminating
RSV ... Shaped charge (HEAT)
ST .... Steel balls

10. Switzerland

a. General. Until recently, the Swiss ammunition market was dominated by two rival firms, Hispano-Suiza and Oerlikon, whose cartridges differed in designation, headstamp marking, and color coding. In recent years, Oerlikon has absorbed Hispano-Suiza, and both cartridge families are now produced with the Oerlikon headstamp. The Swiss Government has also produced cartridges in 20- to 40-mm calibers with headstamp markings that follow the small-arms marking pattern described in Volume I.

b. Projectile Types and Color Coding. Hispano-Suiza and Oerlikon each had characteristic functional type designation and color coding systems that were used for several calibers of cartridges over a period of years. Because of their widespread use, these designations and color codes are shown in tables VIII and IX.

c. Cartridge Marking. Representative headstamp markings on Swiss cartridge are given in figure 12. View A of figure 12 appears on a Hispano-Suiza 30x170 cartridge and view B on an Oerlikon 20x128 cartridge.

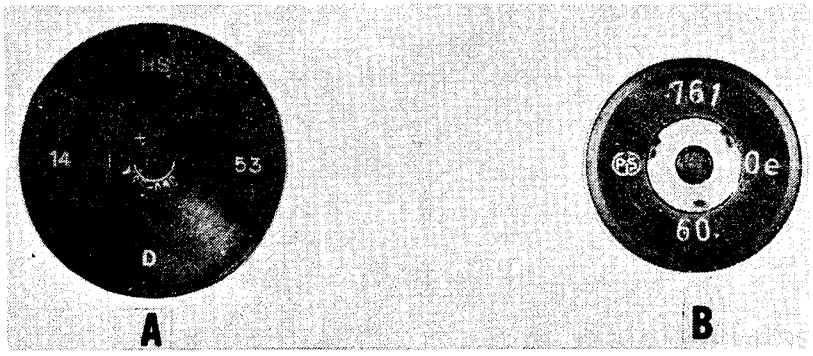


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Figure 12. Swiss Cartridge Headstamp Markings

(Reverse Blank)

Table VIII. Hispano-Suiza Projectile Types and Color Coding

NOTE: "Body" refers to "projectile body"; RB stands for "rotating band."

Letter code	Functional type	Color marking
EP	Practice (P)	Silver body.
ET	Practice tracer (PT)	Silver body; red band above RB.
EDS	Practice spotter-tracer	Orange-brown body.
RI	API	Pink ogive, olive-green body.
RIA	APHEI (SD), w/fuze, BDSD	Olive-green body with broad pink band above RB.
RIC	API w/fuze, base, igniting	Olive-green ogive, pink body.
RID	APHEI, double effect (PD and BD fuzes, no SD)	Pink fuze and body; olive-green band on lower projectile body.
RIF	APHEI w/fuze, BD (no SD)	Pink ogive; olive-green body; yellow band above RB.
RINT	API-T (HC) with tracer	Olive-green body; red band above RB; black band above red band.
RT	AP-T, special steel core	Olive-green body, red band above RB.
UA	HE w/fuze, PDSD	Yellow body, silver fuze.
UAT	HE-T w/fuze, PDSD	Yellow body; silver fuze; red band above RB.

Table VIII. Hispano-Suiza Projectile Types and Color Coding (Continued)

NOTE: "Body" refers to "projectile body"; RB stands for "rotating band."

Letter code	Functional type	Color marking
UIA	HEI (SD), mine, with fuze, PDSD	Pink body, yellow (brass) fuze.
UIAT	HEI-T (SD), mine, with fuze, PDSD	Pink body, yellow (brass) fuze, red band above RB.

Table IX. Oerlikon Projectile Types and Color Coding

NOTE: "Body" refers to "projectile body."

Letter code	Functional type	Color marking			
		Body	First ring	Second ring	Fuze or windshield
MSB/K	HEI (mine) with PDSD fuze	Olive	Light green	None	Unpainted
MSBL/K	HEI-T (mine) with PDSD fuze	Olive	Light	Red	Unpainted
MU	Practice (P) (HEI, mine type)	Blue	Light green	None	Blue

Table IX. Oerlikon Projectile Types and Color Coding (Continued)

NOTE: "Body" refers to "projectile body."

Letter code	Functional type	Color marking			
		Body	First ring	Second ring	Fuze or windshield
MUL	Practice tracer (PT) (HEI-T mine type)	Blue	Light green	Red	Blue
PKLHT	APDS-T (HC)	Black*	Black	Black	Black
PKHT	APDS (HC)	Black	Black	Black	Black
PKLH	AP-T (HC)	Black	Light gray	Red	Black
PLH	AP-T	Black	Red	None	Black
PSBH/B	APHEI w/fuze, BDSD	Olive	Black	None	Olive
PSBLH/B	APHEI-T, w/fuze, BDSD	Olive	Black	Red	Olive
PU	Practice (PT), AP type	Blue	Black	None	Blue
PUL	Practice tracer (PT), AP-T type	Blue	Black	Red	Blue

*Tracer indicated by white T's on body.

11. United Kingdom

a. General. Cartridges made in the United Kingdom present a diversity of markings, reflecting the period of manufacture, using arm or service, and type of weapon. Markings indicating model designation, functional type, and producer may be found on the fuze, projectile body, cartridge case, and headstamp.

b. Cartridge Case Markings.

(1) Cartridge headstamp markings will vary, depending on whether the cartridge was produced for Government use or for commercial sale to foreign purchasers. A typical prewar commercial headstamp is shown in figure 13. The headstamp includes the manufacturer's initial K (for Kynoch, a mark used by Imperial Chemical Industries, or ICI, since the 1930s) and an indicator of the gun for which made--in this instance, the 23-mm Danish Madsen gun. The year of manufacture is 1938. The letter S designates the functional type; it stands for "service practice" and indicates an inert-loaded TP projectile.

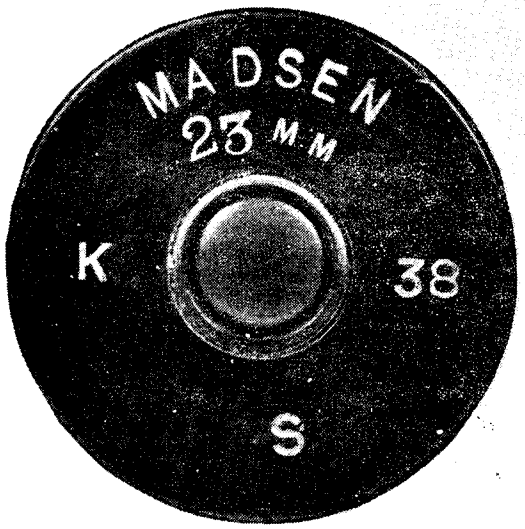

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Figure 13. UK Commercial Cartridge Headstamp Markings

(2) Figure 14 shows typical markings on 20-mm cartridge cases made at Government arsenals. The headstamps resemble those on UK small arms cartridges of the World War II period. The markings shown in figure 14, view A, are on a 20x110 Hispano-Suiza cartridge. Those shown in view B, are on a 20x110RB Oerlikon cartridge, identified by the letters Oe; the letter Z indicates that a nitrocellulose propellant is used rather than double-base cordite. View C shows a 20x110 Hispano-Suiza case that has producer and functional type data stamped above the extraction groove.

(3) The 30x113B ADEN gun cartridges do not have a headstamp; instead, caliber, producer, and year data are stamped into the extraction groove, while functional type, lot, and producer data are stamped on the cartridge case belt. Figure 15 shows the marking on a 30x113B cartridge case.

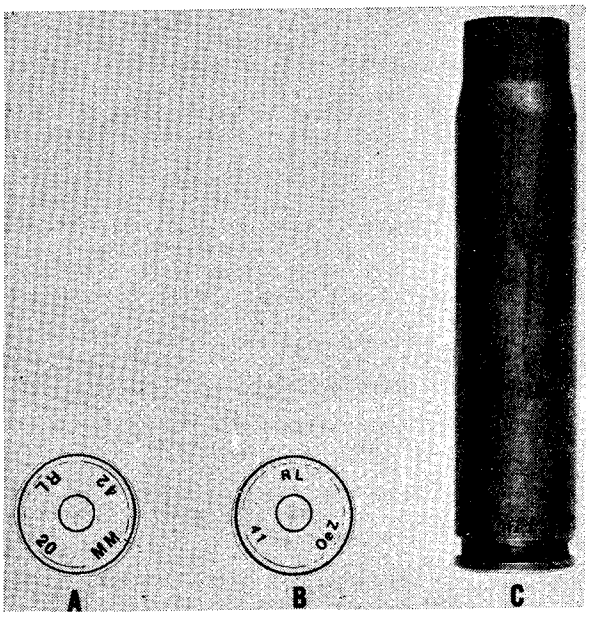

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Figure 14. UK 20-mm Cartridge-Case Markings

Neg. 526203
Figure 15. UK 30x113B
Cartridge-Case Markings

12. United States

a. General.

(1) Markings on US-made cartridges have varied widely over the years, depending on the cartridge caliber, branch of service for which made, and type or purpose of gun.

(2) Fuzes carry stamped model designations, and projectiles frequently bear stamped or stenciled markings (or both) that include functional type and model designations. Stenciled markings may appear on the cartridge case body as well. For the most part, 20x102 and 30-mm cartridges have no headstamp, and identification must be established from markings on the projectile or case body.

(3) Headstamp markings normally include a gun model or cartridge case model designation, manufacturer's initials, and a lot number. The year of manufacture may also appear.

b. Color Identification.

(1) Several color marking systems have been used in the past by the United States, depending on the cartridge's proponent branch of service and weapon type (aircraft gun, AA gun, or tank or AT gun).

(2) The United States now uses for all four services--Army, Navy, Air Force, Marines--the standard NATO color coding system. Under this system, the projectile's primary functional type is indicated by a specific color, normally applied to the projectile body. When the projectile combines two or more functional roles, such as HEI or APHE, the projectile will be painted in an appropriate combination of colors.

(3) When a color for a primary role does not in itself indicate the presence of an explosive or other hazardous component that could either cause the projectile to function in a high-explosive or low-explosive mode or be especially hazardous to the user, its presence may be indicated by a narrow color band of the appropriate color. The width of this band may not exceed one-quarter of the projectile caliber or a maximum of 25 mm.

(4) Table X shows the color marking system that has been adopted by NATO for cartridges in calibers of 20 mm and greater.

Table X. NATO Ammunition Color Codes for Ammunition in Calibers of 20 mm and Above

Color	Significance
Yellow	Identifies HE ammunition, or indicates the presence of a high explosive.
Brown	Identifies low explosive items or components, or indicates the presence of a low explosive.
Gray	Indicates chemical ammunition.
Gray with red band(s)	Indicates a harassing agent filler.
Gray with dark green band(s)	Indicates a casualty agent filler.
Black (note)	Identifies AP ammunition, or indicates an armor-piercing capability.

Table X. NATO Ammunition Color Codes for Ammunition in Calibers of 20 mm and Above (Continued)

Color	Significance
White (note)	Identifies illuminating ammunition, or ammunition producing colored light(s) or indicates presence of light-producing pyrotechnic materials.
Light red	Incendiary ammunition, or presence of incendiary material or agent.
Light green	Smoke ammunition, or presence of a smoke-producing agent.
Silver/aluminum	Countermeasure ammunition (radar echo, leaflet, etc.).
Light blue	Training or practice ammunition; may have explosive components.

NOTE: The colors black and white, when used for lettering, have no coding significance.

c. Cartridge Markings. Figure 16 shows representative US cartridge markings. Figure 16, view A, shows the headstamp and projectile markings on an Army 20x110 cartridge; the headstamp gives the caliber and case model, while the projectile marking shows projectile model and functional type (TP, for target practice). View B shows similar markings on a 20x110 USN cartridge. View C shows the stenciled markings on a 30x173 dummy cartridge with aluminum case. The cartridge has no headstamp.

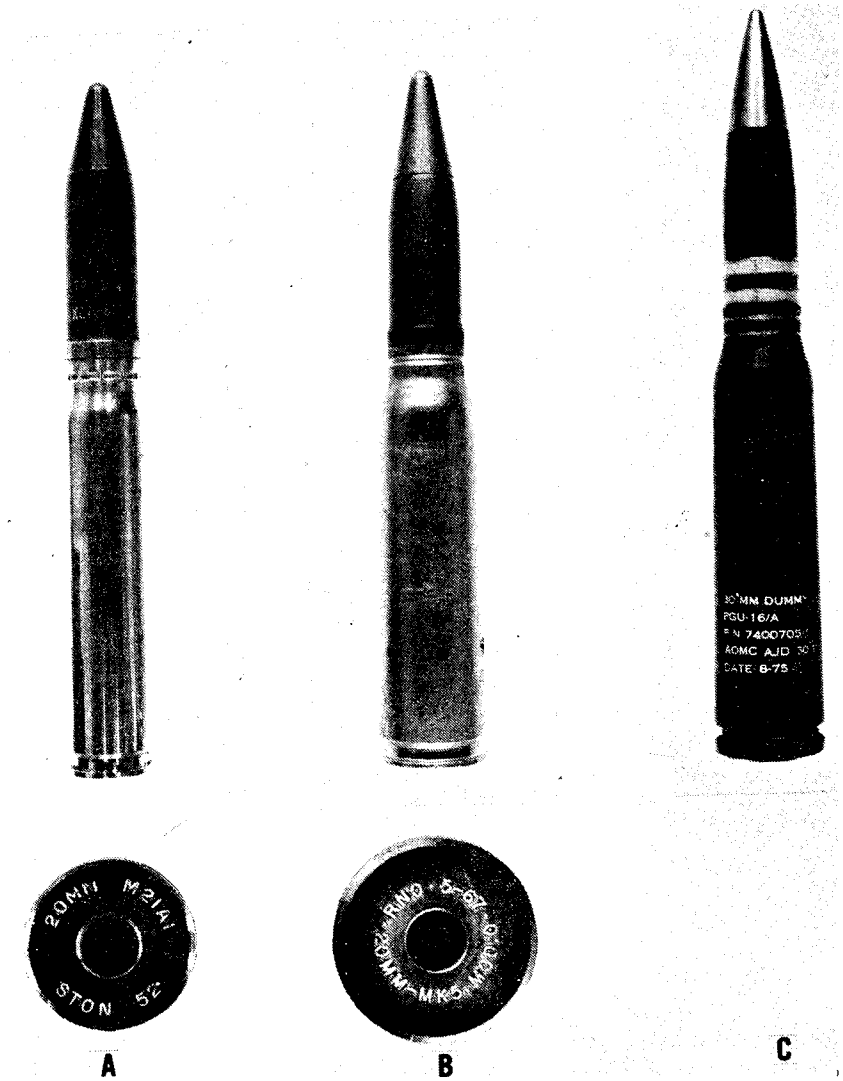

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Figure 16. US Cartridge Markings

d. US Experimental 30-mm Cartridges. In the course of postwar trials with improved revolver-type aircraft cannon based on the World War II German Mauser MK-213 design, the United States produced many types of experimental 30-mm belted cartridge cases in case lengths ranging from 86 mm to 126.5 mm. Table XI provides data on these cases and on the guns and cartridges with which they were used. Although most of these cases were made in small quantities, the 30x100B cartridge for the percussion-primed WECOM 30 helicopter gun and the 30x126.5B cartridge for the T182 and T212 guns were produced in significant quantity. The United States has decided to standardize on the 30x113B cartridge and now has a family of cartridges in this caliber that can be used in the United Kingdom's ADEN gun and in the DEFA 500-series aircraft guns, as well as in US-designed guns.

Table XI. Experimental US 30-mm Belted Cartridge Cases

Case length (mm)	Case designations	Cartridge designations	Gun designations
86	none	T158, T159, T160, T161, T162 (electric-primed)	T121; T241?
100	XM193, XM210, XM211	XM639, XM552, XM554, XM756, XM757 (percussion-primed)	WECOM 30; XM140; XM188; XM230; XM30; XM52
102	FAT 33	T158 series (electric-primed)	probably T121, T182
113	none as yet	M788, M789, M799 (electric-primed)	ADEN; DEFA 500-series; also XM188E1, XM230E1
114	FAT 15	T204, T205, T206, T207, T208 (electric-primed)	T182
126.5	FAT 15E1, FAT 40, FAT 50, FAT 55, FAT 56, FAT 58	T206E10, T239, T240, T252, T253, T270, FAT 48 (usually electric-primed; some percussion-primed)	T182, T212

13. USSR

a. General. Two nomenclature and marking systems are in use for Soviet cartridges in the 20- to 40-mm caliber range. All cartridges below 25 mm in caliber (and the 30x152B and 37x155 aircraft gun cartridges), are identified as to functional type in the same way as small-arms ammunition, i.e., by a two-letter or three-letter Cyrillic designator. In the second system, AA gun cartridges such as the 25x205SR, 25x218, and 37x253R calibers follow the practice for larger-caliber artillery ammunition. Each cartridge type is assigned a designator composed of three or four Cyrillic letters and a multidigit number. The first letter of the designator is always У (U), indicating that the cartridge is of the fixed type. The other two or three Cyrillic letters identify the cartridge as to functional type, as in the first system just described, while the number is specific to the gun in which the cartridge is used.

b. Functional Types and Designators. A limited number of functional types of cartridges exist in this caliber range. Explosive projectiles are normally HEI or HEI-T types, with PD fuzes, although one 30-mm frag-HE type with a BD fuze is known. API and API-T projectiles are today of monobloc type; until the 1950s, API projectiles with hard steel penetrators were used. An incendiary mixture is found under the windshields of API and API-T types. This incendiary is composed of powdered aluminum, magnesium, and barium nitrate and poses no hazard in storage or handling. Projectile designators are presented in their abbreviated Cyrillic form and in transliteration, together with their meaning, in the table.

★Table XII. Explanation of Soviet Projectile Designators

Cyrillic	Transliteration	Meaning
БЭ	BZ	API
БЭА	BZA	API (improved or modified model)
БЭТ	BZT	API-T
ОЗ	OZ	HEI
ОЗТ	OZT	HEI-T
ОФЗТ	OFZT	HEI Frag-T

c. Cartridge Markings.

(1) Fuzes carry stamped markings that include the fuze model number and lot and year data.

(2) Cartridge cases that follow the first nomenclature system described above do not bear stenciled markings on the cartridge case, with the sole exception of 37x155 aircraft gun ammunition. All cartridges that have artillery-type designators follow larger-caliber practice in having stenciled markings on the cases.

(3) Headstamp markings resemble those on small-arms cartridges in that they contain a numeral-type manufacturer's or factory code and a year indicator. Normally, the year indicator is composed of the last two digits of the year, but from 1952 to 1956, Cyrillic letter year codes were used. These are:

Г	1952
Д	1953
Е	1954
И	1955
К	1956

d. Representative Markings.

(1) Figure 17 shows representative Soviet cartridge headstamp markings, all with the producer (factory) code 184. View A is of a 23x152B steel-cased cartridge, views B and C are of 30x155B aircraft gun cartridges, and view D is of a 37x253R cartridge. The headstamps in views C and D have Cyrillic alphabetical year codes instead of numerals.

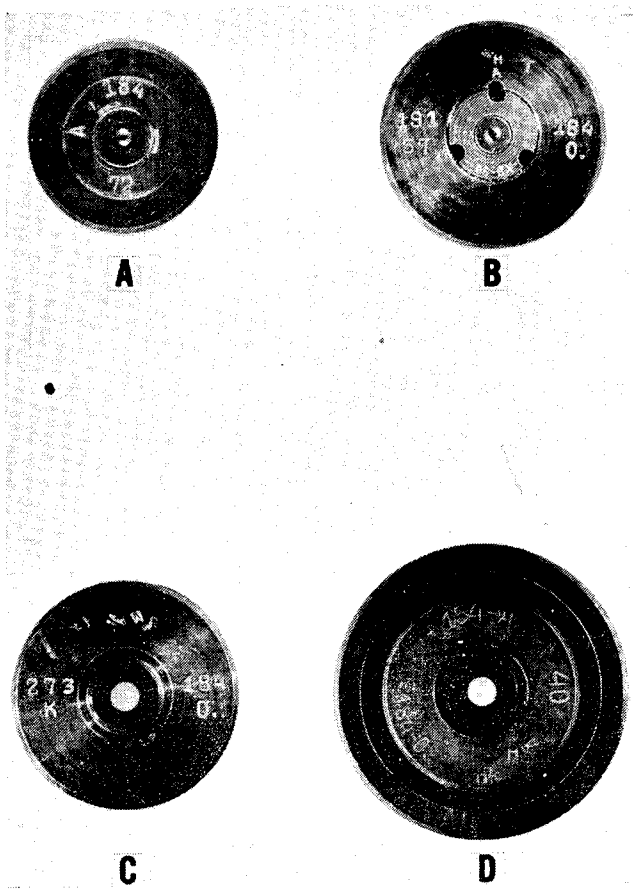

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Figure 17. Soviet Cartridge Headstamp Markings

(2) In figure 18, view A shows the case markings on a 37x155 aircraft gun cartridge, and view B illustrates those on a 37x253R cartridge.

(3) In addition to factory code 184, factory codes 513 and 606 are in wide use for 20- to 40-mm cartridges.

A B

Neg. 526255

★Figure 18. Soviet 37-mm Cartridge-Case Markings

14. West Germany

a. General. West German cartridges can be identified by the characteristic cartridge headstamp, projectile, and fuze model designation markings. Artillery-type primers will also carry the model designation. The letters DM (Deutsches Modell) followed by a one-, two-, or three-digit number indicate that the item is, or was, a standard adopted model. Care must be taken not to identify a cartridge as West German solely on the basis of the headstamp marking or primer model alone, since these components have been provided to other countries for loading with their own propellants and projectiles. In this event, the projectile will carry markings indicating its national origin.

b. Cartridge Markings.

(1) The cartridge headstamp marking may include the cartridge designation (i.e., 20x139) and case and primer model numbers, and normally will include the initials of the manufacturer and a lot number, indicated by the word "Los" (lot).

(2) The projectile is stamped with its model number, the manufacturer's initials, and projectile body lot data. It may have stenciled markings indicating functional type, caliber, model, and lot number of the filled projectile. Color markings will follow the NATO color marking system described in paragraph 12. A nose fuze will carry the prefix letters AZ or AZZ and the model designation, e.g., AZZ DM 131A1. Projectiles and cases made for the United States may carry US model and functional type designations. Some of the German terms and abbreviations that appear on ammunition or packaging are presented in table XIII.

★Table XIII. Germans Terms and Abbreviations Used on Ammunition or Packaging

Abbreviation	German term	English equivalent
AZ	Aufschlagzünder	Impact (PD) fuze
AZZ	Aufschlagzünder, Zerleger	Self-destruct (PDSD) fuze
BZ	Bodenzünder	Base (BD) fuze
BZZ	Bodenzünder, Zerleger	Self-destruct (BDSD) fuze
BR	Brand-	Incendiary
--	Geschoss	Projectile
HK	Hartkern	Tungsten carbide (WC) core
L'spur	Leuchtspur	Tracer (also indicated by T's stenciled on the projectile body)
Pz	Panzer-	AP
SB	Sprengbrand-	HEI
Spr	Spreng-	HE
Üb	Übungs-	Practice

(3) View A in figure 19 shows the headstamp marking on a 20x139 cartridge, view B shows a typical projectile marking in the same caliber, and view C shows a 40x365R cartridge with projectile marking.

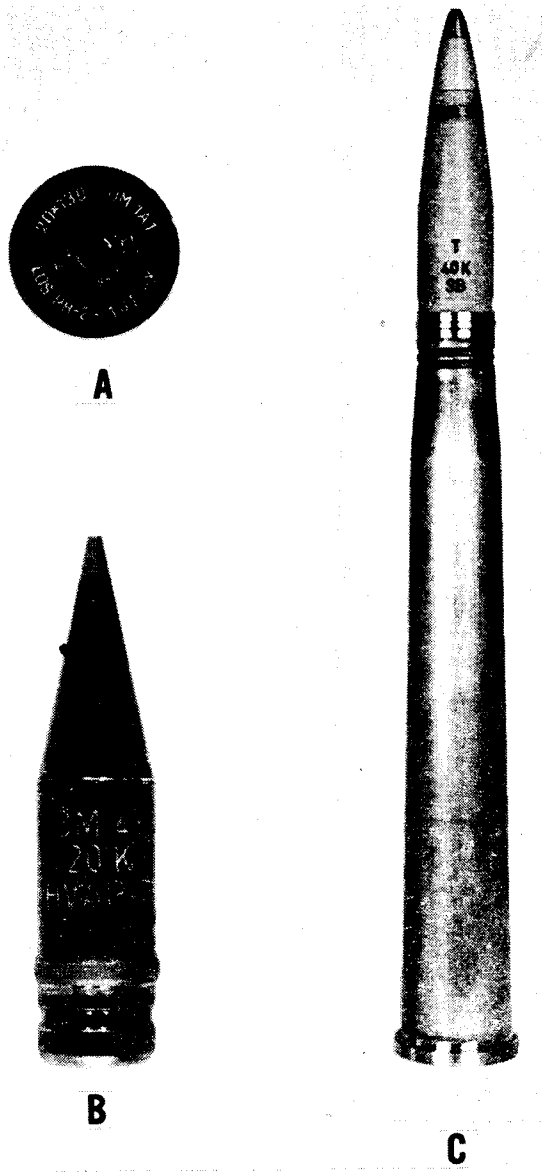

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Figure 19. West German Cartridge Markings

15. World War II--Germany and Japan

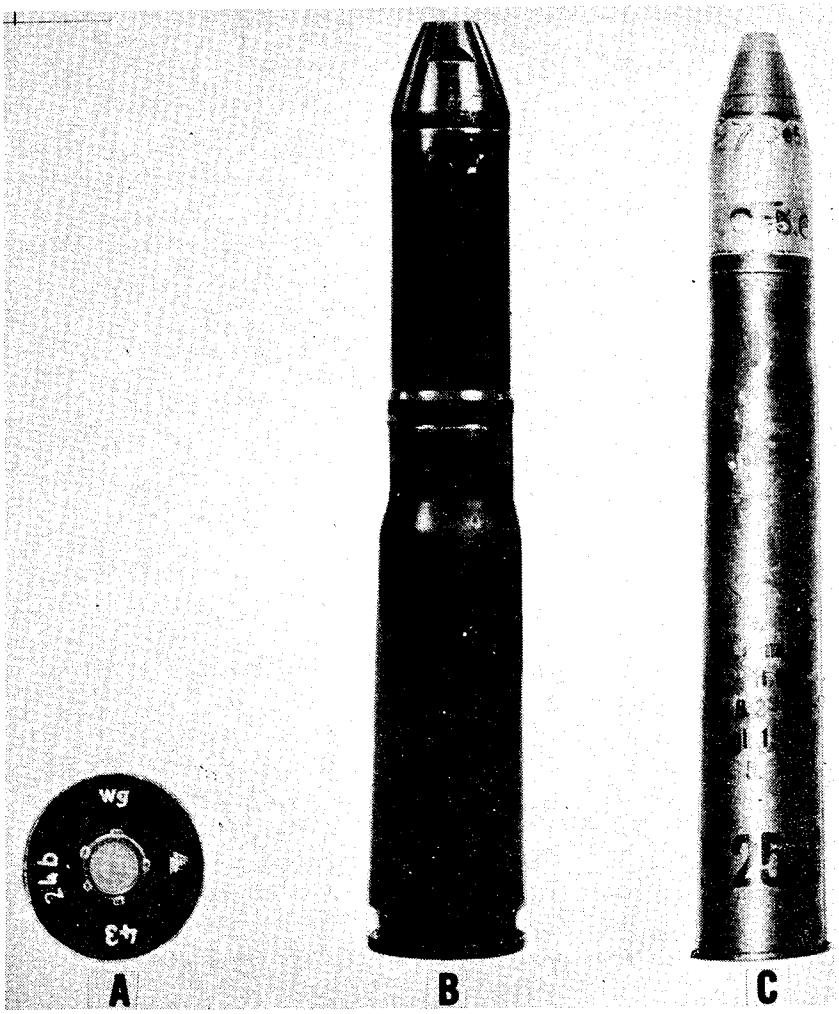
a. Germany.

(1) German cartridges of World War II manufacture can be identified by the characteristic headstamp, projectile, and (often) cartridge-case markings. Despite a considerable variety of styles, headstamp markings beginning in 1941 include a producer code made up of two or three lower-case letters that identify the producer, a lot number, and a two-digit year date. A stylized eagle stamp with either the letters WA for "Waffenamt" (or Ordnance Bureau, for ground ammunition), or the letter L for "Luftwaffe" (for aircraft ammunition), together with a number, may be found in the headstamp or on the projectile. Figure 20, view A, shows a typical headstamp marking.

(2) Projectiles carry a similar producer code, lot, and year marking. Fuzes may carry the abbreviation AZ or AZZ followed by a model number, or they may carry just the number. Projectiles and cartridge cases may also carry stenciled data. Views B and C in figure 20 show the markings on a 20x82 and a 37x250R cartridge respectively. Further details on German ammunition during World War II can be found in the US Army manual TM 9-1985-3/TO 39B-1A-10 (see bibliography).

b. Japan.

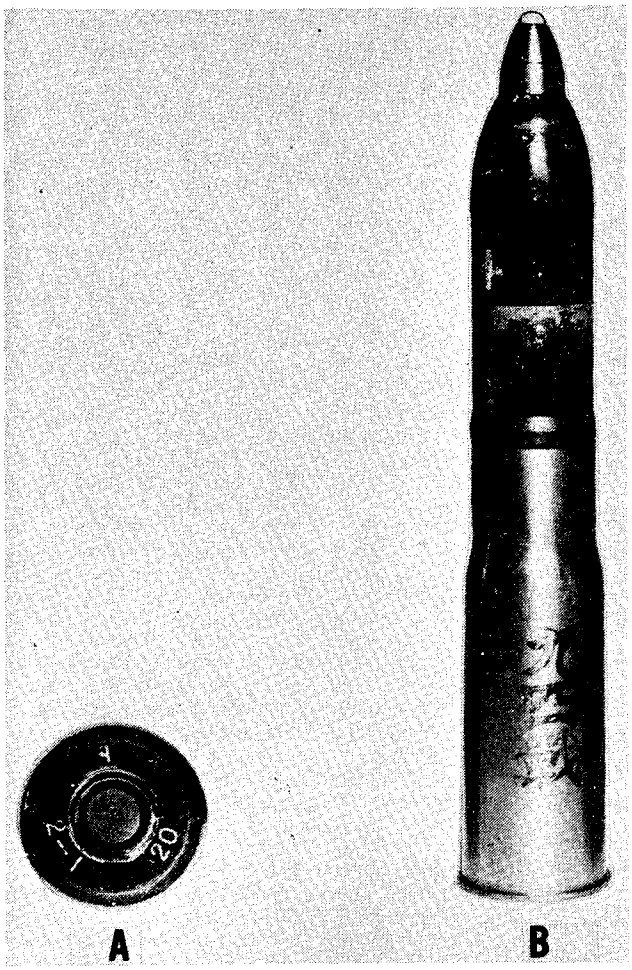
(1) Japanese cartridges can frequently be identified as to country of origin by the cartridge dimensions alone, since many of their cartridges were never produced in any other country. Cartridge designations unique to Japan are so indicated in section III, part B, of this guide. For other cartridges, the presence of stamped or stenciled markings that include Japanese characters is conclusive as to their origin.



Neg. 526253

Figure 20. World War II German Cartridge Markings

(2) Cartridge cases may have no headstamp or may bear a character that indicates the producing arsenal, together with either Western or oriental numerals showing the month and Japanese year of production. Figure 21, view A, shows the headstamp on a 20x72RB cartridge for a naval AA gun.



Neg. 526252
Figure 21. World War II Japanese Cartridge Markings

(3) Projectiles and cartridge cases may carry stamped or stenciled markings that can identify the gun in which used, or the model or functional type of the projectile. Figure 21, view B, shows the marking on a 37x133R cartridge for a Type 94 army tank gun. Further details on Japanese ammunition markings during World War II can be found in the US Army manual TM 9-1985-5/ TO 39B-1A-12 (see bibliography).

✱SECTION V

AMMUNITION INTERCHANGEABILITY

Several of the cartridges presented in this guide can be used interchangeably in two or more weapons. Listed below are significant examples of ammunition interoperability, reflecting only those guns and ammunition in current production and use. It should be noted, however, that the same cartridge will not fit two weapons of different chamber size even though both guns may be of the same caliber. Cartridge priming can also affect interoperability in that cartridges with electric primers cannot be fired from a weapon having only a percussion firing means, and vice-versa.

20x82-mm (Index No. 3)

2-cm Mauser antitank gun
2-cm FLAK 38 AA gun
MG-151/20 aircraft gun

20x99-mm (Index No. 5)

20-mm Soviet ShVAK aircraft gun
20-mm subcaliber device for Soviet
122-mm howitzer, M-30 and M1938

20x102-mm (Index No. 7)

20-mm US M39, M39A1 aircraft guns
20-mm US M61 aircraft gun
20-mm US M50 series aircraft guns

20x110RB-mm (Index No. 9)

20-mm Oerlikon Type "S"
20-mm Oerlikon Mk 2, 3, or 4
2-cm FLAK M28/29 Oerlikon

20x110-mm (Index No. 10)

20-mm Hispano-Suiza HS 404 (percussion)
20-mm Hispano-Suiza HS 804 (percussion)
20-mm US M3 (percussion)
20-mm US M24 and M24A1 (electric)

20x110-mm USN (Index No. 11)

20-mm US Mk 11 and Mk 12 naval AA guns (electric)

20x128-mm (Index No. 16)

20-mm Oerlikon RK 206 aircraft gun (electric)
20-mm Oerlikon RK 251 aircraft gun (electric)
20-mm Oerlikon KAA (204 GK) AA gun (electric)
20-mm Oerlikon KAB (5TG) AA gun (electric)

20x139-mm (Index No. 18)

20-mm Oerlikon KAD (HS 820 series)
20-mm Rheinmetall Rh 202
20-mm US M139

23x115-mm (Index No. 23)

23-mm Soviet NR/NS aircraft gun
23-mm Soviet GSh-23 aircraft gun
23-mm Soviet AM-23 aircraft gun
23-mm Chinese Types 2, 2H, and 2K aircraft guns

23x152B-mm (Index No. 24)

23-mm Soviet VYa aircraft gun (brass case)
23-mm subcaliber device for Soviet tank main guns (brass case)
23-mm Soviet ZU-23 and ZSU-23-4 (steel case)

25x137-mm (Index No. 26)

25-mm Oerlikon KBA AA gun
25-mm Mauser Model E automatic gun
25-mm US M242 automatic gun
25-mm US GAU-12A automatic gun

25x218-mm (Index No. 30)

25-mm Soviet twin naval AA gun
25-mm Chinese Type 61 twin naval AA gun

30x113B-mm (Index No. 37)

30-mm French DEFA Type 551, 552, and 553 aircraft guns
30-mm UK ADEN aircraft gun

30x155B-mm (Index No. 40)

30-mm Soviet NR-30 aircraft gun
30-mm Chinese Type 1 aircraft gun

30x170-mm (Index No. 41)

30-mm Oerlikon KCB (HSS 831 series)
30-mm UK RARDEN automatic gun

30x173-mm (Index No. 42)

30-mm Oerlikon KCA (304 RK) aircraft gun
30-mm Mauser Model F automatic gun
30-mm US GAU-8A automatic gun (percussion)
30-mm US GAU-9A automatic gun (electric)

35x228-mm (Index No. 46)

35-mm Oerlikon KDA AA gun
35-mm Oerlikon KDB AA gun
35-mm Oerlikon KDC AA gun

37x253R-mm (Index No. 62)

37-mm Soviet M1939 AA gun
37-mm Chinese Type 55 AA gun
37-mm Chinese Type 65 twin AA gun
37-mm Chinese Type 74 twin AA gun
37-mm Chinese Type P793 twin AA gun

40x46R-mm (Index No. 70)

40-mm US grenade launcher M79
40-mm US grenade launcher M203

40x53SR-mm (Index No. 71)

40-mm US grenade launcher M75
40-mm US grenade launcher XM175
40-mm US grenade launcher M129
40-mm US automatic grenade launcher Mk 19 Mod 0, 1, and 3

APPENDIX

EXPLOITATION REPORTS ON 20- to 40-MM CARTRIDGES*

(C) W. German 25.5-mm Sig Ctg Model DM-1, Jun 64, FSTC Rpt 381-3052.

(C) W. German 25-mm Tng Ctg, Sep 64, FSTC Rpt 381-3059.

(C) Swiss 20-mm AP-T Ctg, Apr 66, FSTC Rpt CR-20-22-66.

(U) W. German 21.5-mm Sub-Cal Ctg, Mar 67, Rpt Nr SI-8-68,699 APG-DPS 2471.

(C) Soviet 23-mm, FRAG-HEI-T, Type OFZT, Jul 67, Rpt Nr CR-20-08-67.

(C) Swiss 20-mm HEI Ctg, Type MSB/K, Mar 69, Rpt Nr CR-20-151-69.

(C) Soviet 30-mm Ctg, Feb 70, Rpt Nr CR-20-49-70.

(S-NOFORN) 20-mm/30-mm HEI Ammo, Feb 70, Rpt Nr ST-CR-20-62-70.

(U) Soviet 30-mm, FRAG/HEI, Model OFZ, Mar 71, Rpt Nr CR-20-34-70.

*Security classification marking indicates classification of document; all titles are unclassified. For assistance in obtaining any of the above documents, contact the US Army Foreign Science and Technology Center, Library Services Branch (DRXST-IS3) 220 Seventh Street, NE., Charlottesville, VA 22901 (AUTOVON 274-7513).

(U) Belgian 20-mm Tng Ctg, Oct 71, Rpt Nr CR-20-15-72.

(U) Soviet 37-mm FRAG-T, Model VOR-167W, Dec 71 Rpt Nr CR-20-35-71.

(U) W. German 25-mm Tng Ctg, Mar 72, Rpt Nr CR-20-29 (30,32,33)-72.

(U) Bulgarian 23-mm API-T, Type BET, Apr 73, Rpt Nr CR-20-34-73.

(FOUO) PRC 37-mm Ctg, Aug 74, Rpt Nr AST-1140X-039-76.

(U) Israeli 30-mm Ctg, Jul 75, Rpt Nr AST-1360X-149-75.

(C) Ammo, 23-mm (Soviet), Jan 79, Rpt Nr BRL-MR-2898.

(C) 23-mm HEI HEI-T (Soviet), Sep 76, Rpt Nr BRL-2681.

(C) Soviet 23-mm HET and HEI-T Ctg's, Sep 76, Rpt Nr BRL 2681.

(U) Soviet 23-mm Ctg's, Dec 76, Rpt Nr AST-17X-103 (104-106)-75.

(U) Soviet 25-mm Ctg, Dec 76, Rpt Nr FSTC MX-17-66-75.

(U) Egyptian 23-mm Ctg, Dec 76, Rpt Nr FSTC AST-17X-107(108)-75.

(C-NOFORN) Soviet 23-mm Ammo, Jan 79, Rpt Nr BRL-MR-2898.

BIBLIOGRAPHY

1. TM 9-1985-3/TO 39-1A-10, German Explosive Ordnance, 1953 (UNCLASSIFIED).

2. TM 9-1985-5/TO 39B-1A-12, Japanese Explosive Ordnance, 1953 (UNCLASSIFIED).

3. TM 9-1985-6/TO 39B-1A-8, Italian and French Explosive Ordnance, 1953 (UNCLASSIFIED).

4. TM 9-1901-1, Ammunition for Aircraft Guns, 1957 (UNCLASSIFIED).

5. TM 43-0001-28, Army Ammunition Data Sheets, April 1977 (UNCLASSIFIED).

6. DST-1160W-014-82, APers and Armor-Defeating Ammunition Guide--Free World Countries, September 1982 (CONFIDENTIAL).

7. DST-1160S-126-81, APers and Armor-Defeating Ammunition Guide--ECC, June 1981 (CONFIDENTIAL).

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